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The Mining Journal

LONDON, NOVEMBER 18, 1960

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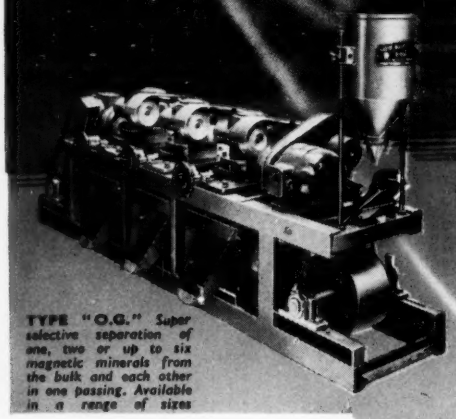

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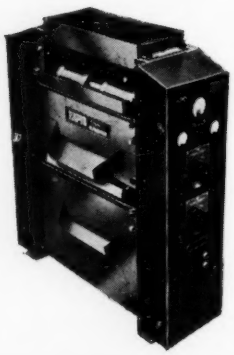

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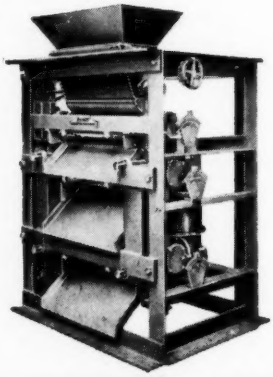

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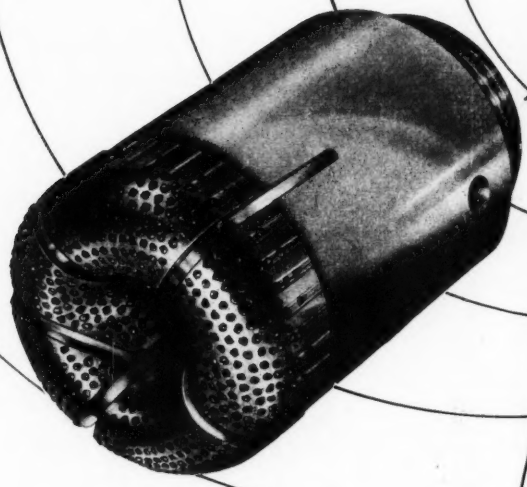

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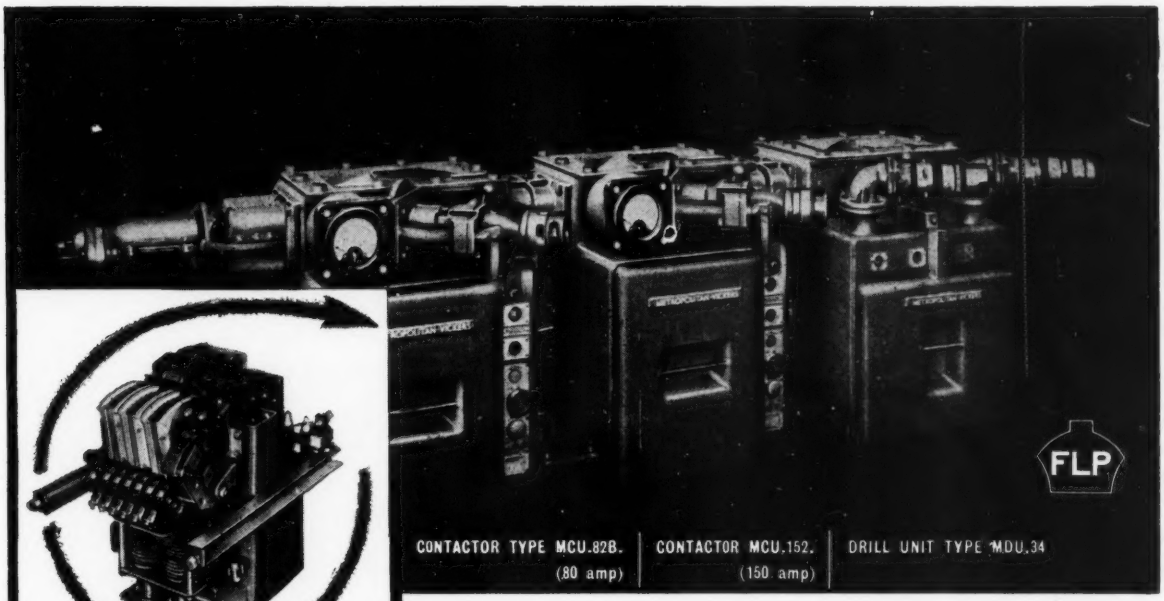

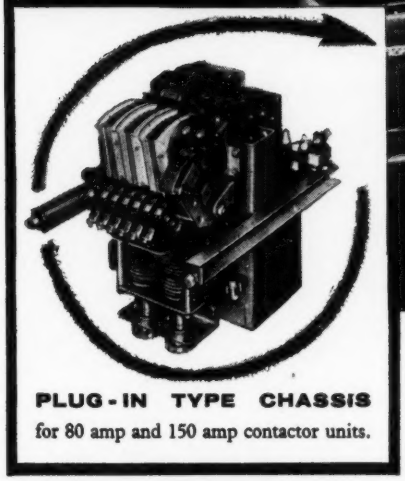

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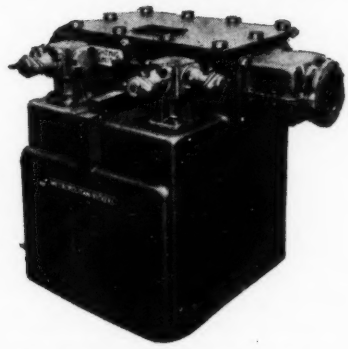

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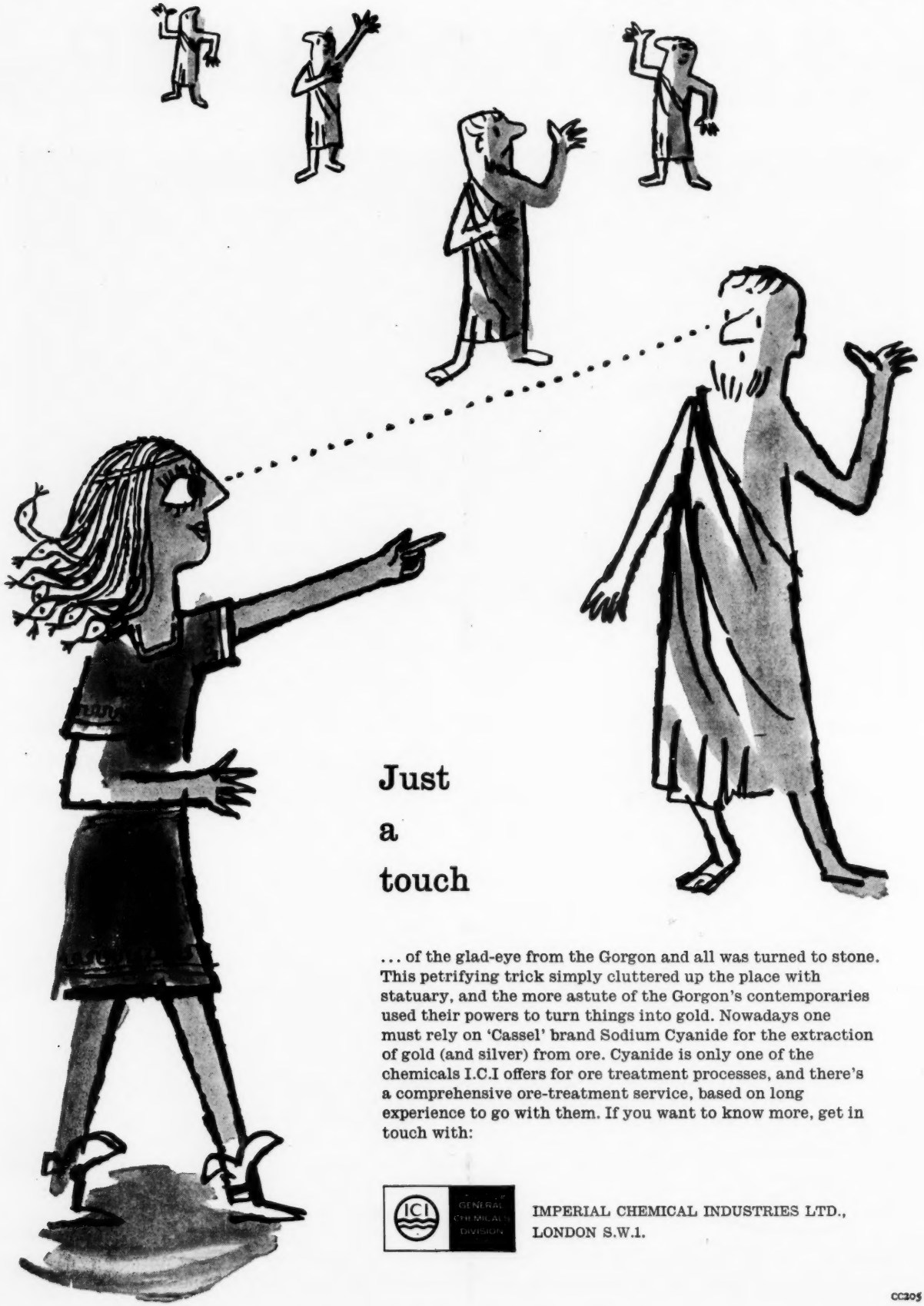

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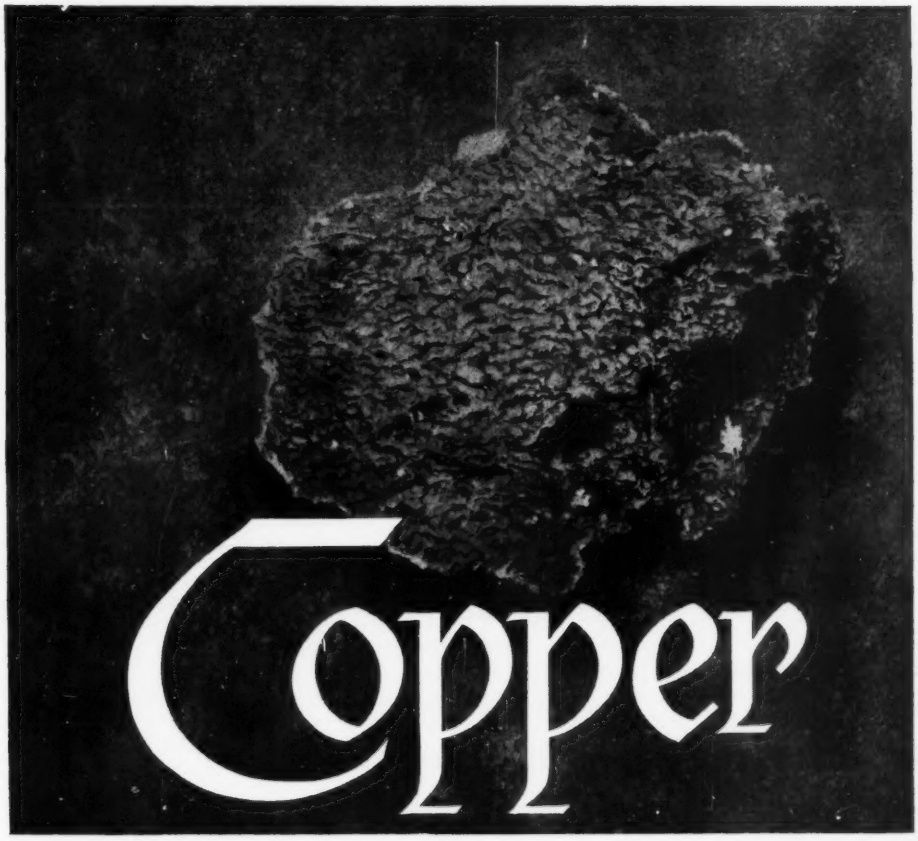

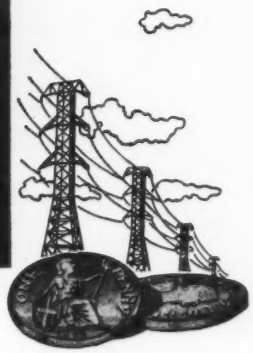

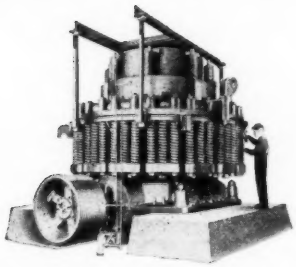

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The Mining Journal

London, November 18, 1960

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Metallurgy and the Mining Engineer

IN few fields of human endeavour is knowledge of the properties and service behaviour of materials of greater importance than in the extraction and treatment of minerals, where the margin of payability is often extremely narrow, while maintenance and replacement costs are liable to be particularly heavy on account of the highly abrasive or corrosive ores and slurries handled in mine installations and flotation plants.

In recent years the range of engineering materials has been increasing with almost bewildering rapidity, due not only to progress in the science of alloying and to the development of "new" metals, but also to the advent of an ever-widening range of plastics and other synthetics, as well as new forms of older materials such as pre-stressed concrete and composite timber units. Clearly it is essential that engineers and designers associated with the design, construction and maintenance of mining machinery and equipment should have a thorough understanding of the materials at their disposal. Leaving aside for the moment non-metallics, this raises the question as to how far the academic approach to metallurgy has kept pace with the almost revolutionary changes that have come about since the second world war.

This was among the questions discussed by Professor J. G. Ball, of Imperial College, London University, in a timely and valuable paper entitled "Teaching of Metallurgy to Engineers", presented on November 16 at a meeting of the Institution of Mechanical Engineers, held in London in conjunction with the Education Group. Professor Ball points out that, in Britain, formal teaching about metals was pioneered only just over a hundred years ago and nearly all academic centres for the study of metals have grown up during the present century. In his view the academic treatment of metallurgy in most centres has changed in the past few years and is still changing, but it is probable that these changes have not yet taken place in any substantial way as regards the teaching of metallurgy to engineers.

We are thus left with two questions, states Professor Ball:

(1) Is the established treatment of metallurgy for engineers adequate for the purpose?, and

(2) What cognisance should be taken of recent developments in the science of metals (and of the solid state in general) in courses devised for engineers?

In answering the first question, the view is expressed that some sub-division of courses is needed to suit various types of engineer, the desirability of sub-division being rendered more pressing by the crowding of syllabuses, which usally means a diminution of the time that can be devoted to metallurgy. For example, the mining engineer is likely to be almost wholly concerned with the behaviour of metals in service and his understanding of metallurgy should be such as to enable him to ensure that failures are at a minimum

and to diagnose the cases of such failures as occur. To a much smaller extent will he be called upon to make decisions about the choice of metals for the construction of machinery, although the choice of tools may fall to him.

On the other hand, the chemical engineer could well be closely involved in plant design where an understanding of many aspects of the metallurgy of a wide variety of alloys would be desirable. The background of ancillary subjects will be different for the chemical engineer from that of the mining engineer and this could have a marked effect on the subject of metals.

The differences between the civil, mechanical, aeronautical and electrical branches of engineering, though probably not so wide, are also regarded as sufficiently marked to justify a special treatment for each group wherever conditions permit. Hence the conclusion is reached that the ideal system would be to "tailor" each course in metallurgy to suit not only a particular group of engineers (mining, chemical, civil, etc.), but also the particular background of the class.

In answering the second question, the paper points out that the mining engineer is unlikely to have an extensive preparation (beyond his university requirements) in chemistry or physics, his course will have a large element of the "vocational" in it, and his learning will be towards mechanical matters. Here, it seems that the emphasis in metallurgy is most likely to be very practical and the understanding of modern ideas in physics and chemistry will be too limited to allow a very deep treatment of modern metallurgical concepts. Some ideas, however, which can be expressed adequately in a brief way, will add interest and coherence in the presentation of the subject, an example given being the concept of dislocations and its application to the explanation of mechanical behaviour.

For the chemical engineer, however, it seems possible and desirable to conceive a course in metallurgy on a very broad basis, spending a substantial part of the time available on basic concepts and, in the later stages, indicating their application to actual alloys and non-metallic materials, without having recourse to detailed discussion of service behaviour.

Since no course can be comprehensive, concludes the paper, it is better, by selection, to present a few basic ideas in a stimulating way than to give a treatment so full that it amounts to little more than a catalogue. Three types of syllabus are outlined as examples of how the subject matter can be rendered attractive, modern and coherent, and are considered in relation to the various classes of engineers.

The paper also refers to the growing body of opinion, especially in the United States, which holds that metals are now not the only materials whose properties the engineer must understand. This thesis is extended by many teachers in the United States to hold that the field is now so large that the classical concepts of metallurgy cannot be "put over" for metals and non-metals in the time available. It follows that a more general and unified approach must be made from which will naturally arise brief specialist treatment of metals, plastics, ceramics, rubbers, etc. The subject then becomes the "Science of Materials" rather than "Metallurgy for Engineers". Professor Ball agrees that there is much to be said for this point of view, particularly where the chemical engineer is concerned, because many of the methods of investigation, testing, etc., as well as the basic science, are now common to modern metallurgy and to the disciplines of studies in non-metallic materials.

U.S. OVERSEAS MINING AND SMELTING INVESTMENTS

The U.S. Commerce Department estimates that this year capital investment abroad by U.S. companies may reach $3,852,000,000. This would be higher by $135,000,000 than the 1959 total of $3,717,000,000, but substantially under the $4,819,000,000 recorded in 1957, the peak year for U.S. capital outlays overseas. Capital investment abroad in 1958 amounted to $4,119,000.000.

Of this year's foreign expenditure, it is expected that $358,000,000 will be invested in overseas mining and smelting ventures, compared with $430,000,000 in 1959. The lower rate of investment abroad by U.S. mining companies is ascribed to the completion of large projects in Latin America.

The Commerce Department gave the following breakdown of U.S. investments in overseas mining and smelting (in millions of dollars, with comparative 1959 figures in parenthesis): Canada 240 (240), Latin America 78 (151), Europe 2 (less than $500,000), elsewhere 38 (39).

Of this year's total estimated plant and equipment expenditure by U.S. industry abroad (in millions of dollars), Canada accounts for 1,229, Latin America for 874, Europe 1,099 and other countries 650. The expenditure of $650,000,000 under the heading "other countries" includes substantial investments in Australia, as well as expenditure on the development of new petroleum reserves, notably in North Africa. It is apparent, therefore, that only a small proportion of the total flow can be going to the underdeveloped countries of Africa and Asia. This underlines the desirability of some system of guarantees or indemnities against the political risks of investment in emergent territories, as discussed in our issue of October 21, pp. 439 and 440.

AUSTRALIA'S IRON ORE RESERVES

When an embargo was placed on the export of iron ore in 1938, it was considered that reserves of high grade (of 60 per cent grade or over), were insufficient for Australia's future needs. The pressure of Western Australia for removal or modification of the embargo, to allow the export of ore from some of the numerous small iron ore occurrences in the State, although these approaches to the Commonwealth Government have been consistently refused, has led to a re-examination of the iron ore position. It is estimated that reserves of a grade approximating 60 per cent Fe are 368,000,000 tons, or 100,000,000 tons greater than when the embargo was imposed, despite the mining of 50,000,000 tons in the interim. The figures include only those deposits sufficiently tested to establish a tonnage of ore which is useable under present economic conditions. Beyond this tonnage, it is stated that there are large tonnages of lower grade ore which, due to research, may have commercial importance in the future.

It is estimated that Australian consumption of iron ore will reach 7,700,000 tons per year by 1970. Present consumption is 4,000,000 tons. At this rate of depletion, the reserves, as stated, are not great, considering the growing Australian demand, so that the wisdom of permitting export of iron ore is very questionable. The supporters of export contend that new ore deposits will probably be discovered before exhaustion of the reserves, which is surely an unsafe and unsound argument in regard to mineral deposits ahead of exploration.

A large deposit of limonitic ore has been reported near Augusta, in the south-west of the State, 200 miles south of Perth. The Griffin Coal Co., whose technical men made the discovery, tentatively estimate a potential tonnage exceeding 60,000,000; average grade is put at 45 per cent Fe. Thickness of the deposit is stated to be up to 8 ft. Preliminary measurement of the area gives an extent of 12,000 acres.

DEVELOPMENT OF ISRAEL'S MINERAL RESOURCES

Concluding its Fifth Session (October 17 to 30) in Jerusalem, the Technological Advisory Board has summarized current activities and future development plans and recommendations concerning Israel Mining Industries Ltd. (I.M.I.) During the first half of this year, improvements in the Timna copper plant have increased production capacity by about 20 per cent. In this period, 2,450 tons of 100 per cent copper valued at $1,540,000 were exported. Some 100 workers are at present employed in the preparatory work for the underground mine and it is aimed to reach a figure of 200 trained miners during the coming year.

I.M I. have produced a five-year plan to expand the copper plant in stages, to achieve a total production of 14,000 tons of 100 per cent copper as follows: (1) 12,000 tons of electrolytic copper, (2) 500 tons of blister and (3) 6,000 tons of copper sulphate (1,500 tons of copper equivalent). The total investment for this purpose is estimated at IL.26,000,000 of which IL.2,500,000 represents working capital. It is expected that the total turnover of the enterprise will amount to IL.23,000,000 in 1966/1967.

Large-scale tests, probably abroad, will have to be undertaken in converting Har-Ramim iron ore (in the Galilee) to steel and in determining what proportion of local to foreign ore can best be used. This should be completed in about two months. Only after the tests have been concluded and evaluated economically, can a decision be taken about the exploitation of this iron ore. It would then be advantageous if a sum of IL.950,000 could be made available in the 1961/1962 budget for the pre-development of the mine and the engineering of the plant.

It has been recommended that the Geophysical Institute, at present mainly serving the oil prospecting companies, should be built up as the central body for geophysical knowledge in Israel.

The Technological Advisory Board also stated that it accepts in principle the research plan submitted by Israel Mining Industries to explore and initiate new ideas and techniques for the exploitation of the country's natural resources. This research scheme requires an estimated investment of IL.2,000,000 (equal to about £400,000 sterling) in the next five years.

U.S. DOLLARS FOR EUROPE

An agreement for a public offering of $35,000,000 of long-term bonds and serial notes on the American capital market by the High Authority of the European Coal and Steel Community was concluded recently in New York with a consortium of American Banks headed by Kuhn Loeb and Co., the First Boston Corporation and Lazard Freres and Co.

In deciding to limit the new issue to $35,000,000 the High Authority has apparently taken into account that the granting of credits to German firms would not be opportune at the present time given the economic and monetary situation in the Federal Republic.

The High Authority propose to reloan the proceeds to firms coming under the ECSC Treaty provisions in France, Italy and Belgium. Part of it will, however, be set aside for reconversion activities in areas affected by pit closures in the Community. This is a particularly serious problem in Belgium.

This latest loan—the fourth raised in the U.S. capital market—brings to $251,000,000 the total loans raised by the High Authority and is indicative of the confidence of U.S. investors in the activities of the Community.

MANGANESE ORE IN GABOON

The year 1962 is now given as the start of exploitation for the manganese ore deposits at Moanda in the Gaboon. These reserves are of some 160,000,000 tonnes of 48 per cent ore; with only a 0.1 per cent phosphorus content, the ore is particularly suitable for the production of ferro-manganese alloys. The first ore shipments are expected to arrive in the embarkation port of Pointe-Noire in May, 1962.

The exploiting company is the Compagnie Minière de l'Ogoué (COMILOG), in which the U.S. Steel Coropration holds 49 per cent and French interests the remainder of the shares. Initial exports will be of 250,000 annual tonnes to the U.S. Steel Corporation, 200,000 annual tonnes to France and 50,000 tonnes to other customers within the Common Market area. The maximum annual production capacity of 850,000 tonnes is expected to be reached in a relatively short time. The investments needed are given as some 420,000,000 francs, of which as much as 79 per cent is stated to be necessary for transport facilities. Manganese ore deposits in the Ogoué and Ikoy areas have been located but are situated very far from the coast. It is further stated from the Gaboon that the Mékambo iron ore reserves owned by the Société des Mines de Fer de Mékambo (see *The Mining Journal*, August 19, 1960), will not be exploitable until at least 10,000,000 tonnes can be exported annually. Shipments would take place from the 375-miles distant port of Ovendo.

SOVIET IRON ORES ON WORLD MARKETS

The Soviet Union will very soon be in a position not only to supply the entire Communist world with iron ore but also to exert a growing influence on world markets, stated the Russian Minister for Geology and Mineral Reserves, P. Antropov, at a Press conference in Moscow last month.

With a current annual output of some 105,000,00 tonnes, the Soviet Union is now planning to increase production in the Kursk area alone to 36,000,000 tonnes a year by 1965 by the introduction there of a new 5,000,000 tonne capacity mine. Work is now being carried out on the exploitation of recently-discovered iron ore deposits of 56 to 69 per cent iron content ores, as compared to the average 35 per cent content of known sites. Exploitation is soon to begin on the newly-discovered Masanov deposits in Asiatic Russia which extend for 30 km.

TESTING COLLIERY GEAR — III

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THE method depends on the distortion of the magnetic field by a discontinuity, or on the difference in magnetic properties of the discontinuity and the main body, in a magnetized mass of metal. Owing to the lower magnetic permeability across a discontinuity, compared with that of the main body, the magnetic field passes around the discontinuity taking the path of least reluctance. When the discontinuity is open to the surface, the magnetic field leaks out at this point, forming local magnetic poles at the edges of the discontinuity. Fine discontinuities just below the surface cause some distortion of the magnetic field sufficiently for it to be detected at the surface; however, the leakage is much less and consequently weaker indications are obtained. If the discontinuities are too far below the surface the magnetic field will pass around them without leaking out to the surface and no indication will be obtained.

The distortion of the magnetic field or the difference in magnetic properties is revealed by applying to the magnetized mass a finely divided paramagnetic material such as iron dust, which may be applied dry as a powder or suspended in a suitable vehicle. Wherever local poles are set up or the magnetic field leaks out at the surface, the indicating medium builds up, showing both the location and shape of defects. The indicating medium as a liquid suspension ("magnetic ink") is obtainable in different colours. Fluorescent ink may also be used, in which case an ultraviolet lamp is used for examination.

Maximum distortion of the magnetic field occurs when the long axis of the discontinuity is at 90 deg. to it, giving the greatest sensitivity. When the long axis of the discontinuity lies parallel to the field there is little or no disturbance and the test sensitivity is a minimum.

The material under test may be magnetized by using an alternating current of a high amperage at a low voltage or by a direct current or a magnet. For this purpose numerous types and arrangements of apparatus are available. Some units serve only as a source for supplying the magnetizing current and are portable, whilst other units develop the magnetizing current, support the article under test, contain the indicating medium and provide means of applying it. Apparatus is available which will provide either a.c. or d.c., or it may provide both types of magnetizing current. Generally the apparatus is provided with some means of regulating the current, and with various types of contacts for applying the current or magnetic field to the article under test.

Portable or transportable devices are particularly useful for field work; they are either electrically operated or incorporate permanent magnets. Devices are available with adjustable magnets and adjustable pole pieces; they are very flexible and are safe to use in any locality.

Techniques

In practice there are two main methods of testing:

(a) The magnetic flux method, giving longitudinal magnetization.

(b) The current flow method, giving circular magnetism at 90 deg. to direction of the current.

In the magnetic flux method, the article tested can be placed in the field of either a strong permanent magnet or an electro magnet. A magnetic field parallel to the long axis of the work piece is produced by placing the piece in a solenoid. The metal component under test then becomes the core of an electro-magnet and is magnetized by induction from the magnetic field produced by the solenoid. Very long articles can be magnetized in steps by moving the solenoid along their length.

In the current flow method an alternating current of high amperage and low voltage, obtainable by transforming a.c. mains supply, is passed either through the component or through a copper or brass rod on to which the component is threaded.

Preparation of Specimens

Magnetic crack detection can be carried out on almost any type of surface, but the state of the surface has an important bearing on the sensitivity of the test: smooth machined and polished surfaces give the best results, while rough surfaces can give false indications. When the test has to be applied on, say, forged or cast surfaces, it will help if the surface is hand filed or ground in the approximate location of a possible defect. Whenever practicable the surface should be shot-blasted, this giving a suitable finish. An improved surface can be obtained by applying a coat of quick-drying paint in a colour contrasting with that of the indicating medium to be used.

Protective coatings such as primers, paints, enamels and similar non-metallic coatings, or non-magnetic electroplated finishes such as cadmium, copper, tin and zinc do not interfere with the performance of the test, unless the coatings are exceptionally heavy or the discontinuities unusually small. Chromium and nickel plated surfaces do not generally interfere with the detection of discontinuities open to the surface of the base metal, but they do interfere with the indications produced by fine discontinuities below the surface of the base metal. Nickel, being more strongly magnetic than chromium, is more effective in suppressing indications.

The component to be examined is first magnetized in one direction by any method applicable to it. The crack detection medium is applied while the current is still switched on, and the particle pattern or indication then observed. The direction of the magnetic field is then turned through 90 deg. either by changing the position of the contacts or by using the other method of magnetization, e.g., changing from current flow to magnetic flux.

ar by Magnetic and Penetrant Methods

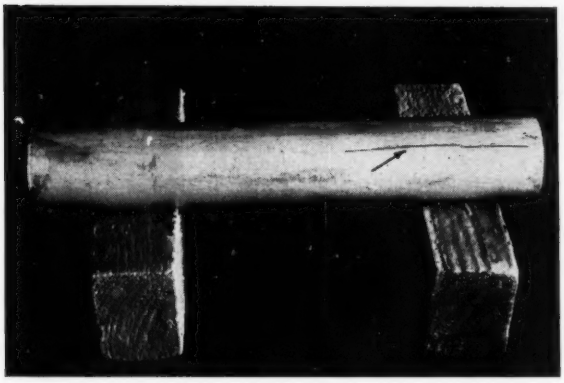
Magnetic crack detection is a rapid method of non-destructive testing for ferro-magnetic materials to determine defects such as cracks, seams, blowholes, laps and the like. Penetrant methods are a sensitive means of detecting the presence of surface discontinuities in all types of materials. This article concludes our series on the non-destructive testing of colliery materials condensed from N.C.B. Bulletin 60/219

The current necessary and method of application are governed by the shape and size of the component being tested. In the case of large articles, it is necessary to magnetize in stages of about 12 in. each time. Too high a current will give random adhesion of the detection medium, masking any small defects, while too low a current will not reveal the defects.

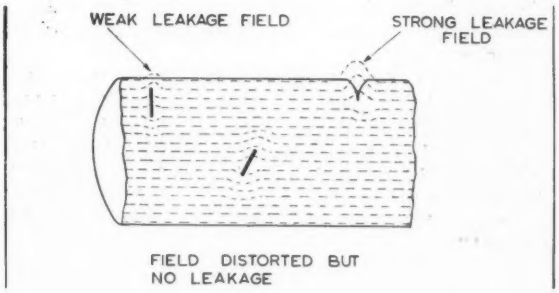
When using alternating current it is possible to switch off at a point on the wave cycle when the component is almost completely demagnetized and it is therefore advisable to cause a number of current impulses to flow, to make this less likely. Some a.c. machines are fitted with a device which automatically cuts off the current at or near its peak.

Engine or machine parts that have been strongly magnetized are generally demagnetized before being put into service; otherwise during service they may attract filing grindings, etc., which may score the bearing or wearing surfaces. The component can be demagnetized by passing it through a solenoid energized by an alternating current. When this is not practicable, as in the case of large articles, an alternating current is passed through the component and gradually reduced to zero. Some machines are already equipped with means of demagnetization.

The method can be readily applied to any ferromagnetic material to detect surface or sub-surface defects of all



kinds. It is, for example, particularly useful for detecting fatigue cracks in fillets, screw threads, etc., and quenching or grinding cracks in tools.



At left, bottom of opposite page, the detection of a defect having a major axis at 90 deg. to the magnetic field. Above, in centre of this page, the detection of a longitudinal defect. Above, at top right, the distortion of a magnetic field by discontinuities

Penetrant Methods

Penetrant methods of non-destructive testing are a sensitive means of detecting the presence of surface discontinuities such as cracks, folds, fissures, shrinkage cavities, etc., in all types of material. They are used extensively for testing non-ferrous materials and austenitic stainless steels, since magnetic crack detection is applicable to ferromagnetic materials only. An added advantage of this test is that there is no directional sensitivity as with magnetic crack detection.

Cracks and cavities which are open to the surface are made to absorb a penetrating fluid by soaking the part to be tested in a liquid of low viscosity and surface tension such as a suitable petroleum fraction. On drying the surface and allowing to stand, the fluid emerges from the defects and thus reveals their presence. The clarity of indication can be increased by white-washing the surface or dusting with fine french chalk and by adding dyes or fluorescent material to the fluid.

With careful cleaning and preparation of the surface good indications can be obtained of fine cracks, etc., which are open to the surface, but the sensitivity is not as great as that obtained by magnetic crack detection.

Since this test depends upon the liquid penetrating into any surface discontinuity, it is essential that the surface be absolutely free from any oil, grease or foreign material which would prevent penetration. Scale and other materials adhering to the surface must also be removed, otherwise false indications will be obtained due to the seepage of the penetrant from under them.

The article to be tested is first cleaned and degreased, and then immersed in a bath of the penetrant; where this is not practicable the penetrant can be sprayed or brushed on to the surface. Sufficient time is then given for the liquid to penetrate into any discontinuities, the length of immersion time being dependent on the character of the discontinuities being sought. The excess penetrant is drained off and the surface of the article washed with a suitable solvent. The surface is then dried using a cloth or sawdust, etc. After allowing the article to stand for a short time the penetrant seeps from any discontinuities, fluorescing when examined under ultraviolet light.

Penetrant methods have been successfully applied for the examination of austenitic stainless steel fan blades, for the examination of porosity in phosphor-bronze bearings, and for the examination of the quality of brazing and for cracks in carbide-tipped tools.

Mineral Resources of the Kinta Valley

NOW that Malaya's tin mining industry is free of all forms of control and restriction for virtually the first time since the slump of the 1930, comes the timely publication of an authoritative work which, although confined to the Kinta Valley, crystallizes the industry's greatest need — an immediate and intensive prospecting programme coupled with a sound government mining land use policy.

The co-authors of the work draw attention to the continuing validity of the recommendations of the Fermor report on the mining industry which was made over 20 years ago; these stated, in effect, that all tin-bearing tracts, wherever situated, should be prospected, and that, wherever possible, this prospecting should be entrusted to private enterprise.

From 1876 to 1950 the Kinta Valley, site of the world's largest and richest single alluvial tin-ore field, has yielded some 1,200,000 tons of metallic tin and the authors of the memoir conclude that the mineral wealth of the Kinta tin-field is still far from being exhausted but "an immediate extensive prospecting programme would be required to ensure that production may continue at its full potential".

Inadequate Prospecting Data

They point out that the difficulties of assessing the future of tin-mining in Kinta are chiefly due to inadequate prospecting data and recall that, while more than one attempt has been made to assess the reserves and estimate the life of the field, all have been proved by actual mining results to be far from accurate.

An official report of the 1880s stated categorically that European miners would never make a success of tin-mining in Perak. In 1901 a commission resolved that "the richer known deposits of alluvial tin-ore are being rapidly worked out" and the Lemon Tin Commission (1918) gave as the main cause for a reduction in output the progressive exhaustion of the most accessible and easily worked principal mining fields.

Yet, as the memoir points out, between 1893 and 1932 the total annual production of tin in the Kinta District never dropped below 12,000 tons. Following the post-war rehabilitation of the industry, production has reached a steady 25,000 tons of tin annually.

"Throughout the first 50 years of mining in Kinta prospecting was rarely more than a few years ahead of actual mining operations, and only when the depression of the 1930s made necessary international restriction of production, did an overall assessment of the resources of the Kinta Valley and of the whole of Malaya become important."

The need for an intensive programme, together with an enlightened land use policy, are underlined in "The Geology and Mineral Resources of the Kinta Valley, Perak", published by the Federation of Malaya Geological Survey as District Memoir No. 9. The authors are F. T. Ingham, Ph.D., D.I.C., M.I.M.M., F.G.S., former Director, Geological Survey, 1946-1952 and E. F. Bradford, B.A., B.Sc., A.R.C.S., F.G.S., Deputy Director, Geological Survey.

In 1937 the Senior Warden of Mines made the first attempt at estimating the total proved reserves of tin-ore in the (then) Federated Malay States and he obtained a figure of about 500,000 tons of tin metal for Perak State, about 75-80 per cent of which would probably be produced in the Kinta Valley.

Fermor Recommendations should be Implemented

Production in Perak from 1938 to 1956 was, in fact, slightly in excess of this estimate and although on the face of it tin-mining should thus have ceased several years ago, the co-authors of the memoir estimated that in 1952 the total proved reserves in the Kinta Valley "are probably no more than what they were in 1937, and it is of vital importance that systematic prospecting should be resumed as soon as conditions permit".

Malaya's tin miners will agree wholeheartedly, for in the past 20 years have come the Japanese Occupation; the necessary rehabilitation of the industry, which had still not been completed when the Emergency broke out in 1948; and the restrictions and defensive measures brought by the Emergency which was finally declared ended only a few months ago.

And Malaya's tin miners will agree wholeheartedly with the authors' suggestion that the Fermor recommendations should be implemented as fully as possible. It is not the first time that these recommendations have been brought to the notice of the Government and that State Governments which, of course, are responsible for land matters within their boundaries.

The International Bank Mission did so in 1954 and the recommendations were echoed and added to by the Federation's Land Administration Commission which sat in 1957.

by a Special Correspondent

One of the Fermor recommendations was put into practice in 1954 when the Mineral Investigation Drilling Unit was set up jointly by the Geological Survey and the Department of Mines. This unit prospects on behalf of government in cases where private enterprise is unable or unwilling to prospect, or where there are conflicting interests between miners, agriculturists and others.

Dr. Ingham and Mr. Bradford state in the Memoir that once a satisfactory prospecting programme is established, the future prospects for tin-mining in Kinta will depend primarily on the discovery of hitherto unknown deposits but point out "that 75 years of mining have left untouched few potential alluvial mining lands in Kinta and no rich areas of any large extent remain likely to be discovered. It is therefore inevitable that there will be a gradual decline in production from alluvial deposits. . . . As the alluvial ground becomes depleted attention will have to be paid to eluvial and residual deposits".

They suggest that deposits may still be found in tracts of deep alluvium that are beyond the effective digging

depth of dredges and draw attention to the known deep deposits in granite-limestone contact troughs which remain unworked because of the technical difficulties of working along a narrow channel " but these may be overcome in the future by improved mining methods ".

There is the possibility also that lodes, pipes, or similar deposits may be discovered, and the authors instance the post-war discovery of rich values on an estate near Ipoh as proof that it is possible for valuable deposits to be overlooked for 70 years or more. Early mines, working pipes of ore that ceased operations because of flooding, might possibly be re-opened if further prospecting justifies the capital expenditure required.

It is suggested that diamond-drilling may become a means of prospecting for underground lode tin-ore deposits and that geochemical prospecting methods may be used to discover lodes of tin-ore that might be concealed beneath a relatively undisturbed residual soil cover.

The re-working by modern methods of land mined earlier, the mining of " deep " deposits and of land hitherto blanketed, are other sources of ore noted by the authors, who state as an example in support of the latter that an estimated 20,000 tons of tin metal have been made available by the deviation of a six-mile stretch of the Kinta River.

Other Factors Affecting Future Prospects

" However, the factors influencing the future prospects for tin mining in Kinta are not entirely confined to the question of geological environment and the possible discovery of hitherto unknown deposits, but include also the effects of technical advances, administrative control and economic and political pressures."

But the authors consider that without an enlightened land use policy that acknowledges the contribution made by the miner to the prosperity of the country and overcome administrative delays in dealing with bona fide prospecting and mining applications, technical improvements will be in vain.

" Ultimately the length of life of the Kinta tin field will depend not only on the possibility of there being present hitherto undiscovered deposits, the adoption of efficient modern methods of prospecting and mining and on improvements in mineral extractive recovery, but also on a sound government mining land use policy, on the stability of the tin market and in the repercussions of international politics."

It is perhaps as well to remember that the first draft of the Memoir was completed in 1953 essentially in the form in which it is presented and that in the intervening years technical advances have been made in mining techniques and ore extraction methods.

As Dr. J. B. Alexander, present Director of Geological Survey, states in a preface dated March 8, 1958, the Memoir contains much useful information of an historical and statistical character, besides indicating the future prospecting for mining in this part of Malaya, so that it should prove to be of particular interest and value to the mining community in Perak.

The lessons pressed home in the Memoir are, of course, in the main applicable to all parts of Malaya wherever there is land to be mined and thought possible to mine. And miners, in particular, will note that the Memoir is published under the aegis of the Ministry of Rural Development which has taken over the mining portfolio previously held by the former Ministry of Natural Resources.

Assisting Small Mining Operations in Under-Developed Countries

PROGRAMMES designed to give technical and capital assistance to small industry in under-developed countries tend to give preferential consideration to industries producing consumer goods. Raw material-producing industries are frequently overlooked, even though their need for assistance is often just as great. Small producers of mineral raw materials have been especially neglected.

Nevertheless, small mining operators are frequently in need of technical guidance; indeed, many small marginal " fair weather " producers in under-developed countries could undoubtedly be transformed into more stable enterprises through the introduction of relatively minor technical innovations of which the operators are unaware. There are tens of thousands throughout the under-developed world whose welfare depends on the continued and successful operations of small mines. Moreover, the combined production of these small mineral workings may make a not unimportant contribution to total mineral production.

Because small mineral producers are so numerous and widespread and generally situated in remote areas, because their production is generally not large or of critical importance, and particularly because they are often situated on unproven deposits with an uncertain future, it is difficult (and often impossible) economically to justify an assistance programme based on individual attention to their problems.

A Special Technical Manual

It can frequently be observed that the unsolved technical problems confronting a small miner in one country have been resolved without his knowledge by small mine operators recovering the same mineral in another. Furthermore, small mine operators producing a particular mineral in one country may be employing installations and techniques which are superior to those used by operators producing the same mineral in other countries, simply because the former have received technical guidance at one time or another from government agencies or other sources and word has not spread.

In this situation may lie the key to an effective means of assisting the small miner, inasmuch as in the perfected

installations and techniques which are a reflection of the long experience and resourcefulness of one segment of the small-mining community, we have a vast, ready made pool of field-tested ideas whose adoption would very likely be of benefit to the other segment. If we grant that the dissemination of the ideas contained in the pool would yield fruitful results, then the problem becomes one of finding an alternate, effective, and economically realistic way to bring about this dissemination.

This probably could be achieved through the publication and wide circulation of an elementary manual of small mining operations aimed specifically at the small miner in under-developed countries. In it would be presented, for each mineral amenable to small-scale primitive exploitation, a synthesis of all the best ideas culled from a critical field-study of a variety of successful small mining operations, supplemented by whatever appropriate material the literature may yield.

The military authorities in North Sumatra, Indonesia, in an effort to create employment for veterans, concluded that the mining by primitive methods of one of the numerous mineral "deposits" in that area offered an attractive opportunity requiring minimum capital outlay. It appears that several thousands or tens of thousands of tons of fairly rich lead ore are available at and near the surface and are recoverable by primitive methods. It is estimated that perhaps two or three hundred men can earn a living, for several years at least, by exploiting the deposit. Lead has never been mined in Indonesia in more than negligible quantities and none of the prospective miners has had previous experience in any kind of mining.

There is considerable danger that this endeavour will fail, simply because the participants, lacking previous mining experience, intend to employ only the most obvious extraction and concentration techniques (selective mining by hand and hand sorting), whereas slightly more sophisticated but still primitive methods will probably have to be used if the operation is to sustain itself commercially.

The Miner's Problem

Briefly, the prospective miners' problem is simply that, because their deposit is situated several kilometers from the nearest road, it will be necessary to carry out the mined products, and as they do not have previous experience in concentrating lead ore, they will probably find themselves carrying out a lot of waste material—a situation which would make the undertaking uneconomic.

The prospective miners have been made aware of the shortcomings of their plans and the erection of a primitive lead smelter at the mine has been recommended. If this is done and the resulting raw (pig) lead carried out, losses resulting from the transportation of waste will be reduced to zero. It will be possible to mine lower grade ores than would otherwise be practicable, and a commercially profitable operation may result.

Unfortunately, however, although there were experts available who were able to advise the prospective miners that the erection of a primitive smelter might result in a sounder undertaking, none were sufficiently familiar with the details of construction and special operational problems of such a smelter to instruct the miners adequately.

Lead ore, nevertheless, can be and, in certain countries, is treated in primitive smelters erected at the mine largely out of simple, locally available materials. Certain lead mines in the district of Bawzain, Southern Shan states and in Wa state in Burma are cases in point. Here, primitive techniques for the smelting of lead ore and lead-bearing slags from centuries-old dumps have been developed over a long period of time.

One answer to the problem facing the prospective North Sumatran miners clearly lies, then, in familiarization with the primitive Burmese operations.

This situation obtaining, the benefits that could be derived from an elementary manual in which an adequate description of a primitive lead smelter were presented, immediately become apparent. The description could incorporate all the best features of numerous lead smelters studies in the field plus whatever additional relevant material may be extracted and simplified from the formal literature. Such a manual is now proposed.

There exist many other opportunities to introduce, through the use of a manual, prospective small miners to effective primitive installations developed elsewhere, and to improve existing installations and techniques by drawing on the experience and resourcefulness of others.

Contents of Proposed Manual

The manual envisaged would contain, first and foremost, well illustrated, simply expressed instruction for the construction and operation of the kind of primitive installations already discussed. All minerals amenable to primitive exploitation would be included in a systematic way. Unlike existing handbooks on the subjects of mining and ore treatment, a relatively low level of technical literacy would have to be assumed in the presentation of material. Because of the generally limited financial resources of the small miner in under-developed countries, emphasis would have to be placed on improvisation and the use of locally and readily available materials

Inasmuch as pronounced differences in available financial resources may exist among those who consult the manual, maximum effectiveness would again be achieved if several examples of mining and concentrating techniques were presented for each mineral, ranging from the most elementary and improvised to more complex and costly layouts entailing the use of some standard equipment.

In addition to purely instructive material on mining and processing, the manual could profitably include many other things of interest and value to the small mining entrepreneur. Among these may be mentioned a directory of ore and metal buyers and of custom smelters in each country within and adjacent to under-developed areas; a directory of manufacturers and dealers in used, inexpensive, low capacity mining and milling equipment in different parts of the world; an abbreviated illustrated catalogue, with specifications, of the kind of small, simple mechanical and hand-powered equipment in which a small miner may be interested.

A compilation of all industries consuming mineral raw materials, with indication of the minerals consumed by each, would be of value. A list of simple field tests for the identification of ore minerals and a brief discussion of prospecting techniques and guides to mineralization would also be of value. Publication in several languages would be desirable.

This article is condensed from a paper by Dr. George V. Mueller, published by the International Industrial Research Development Centre, Stanford Research Institute, California. Dr. Mueller was until recently Colombo Plan Mineral Resources Adviser to the Government of Indonesia State Planning Bureau

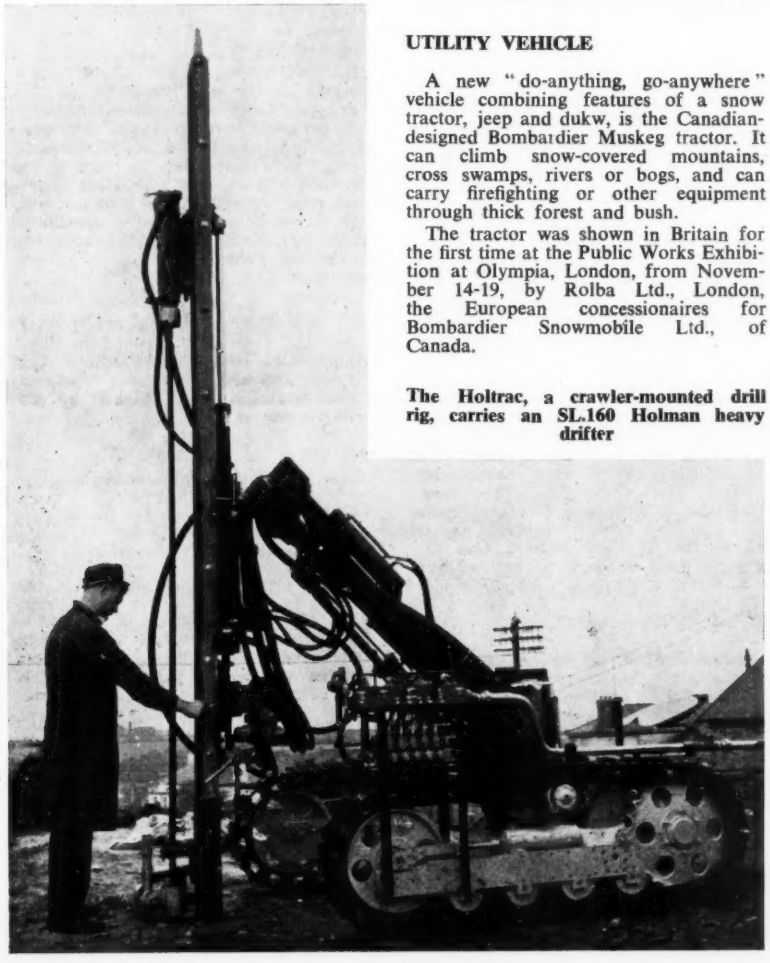
Machinery and Equipment

Crawler-Mounted Drill Rig For One-Man Operation

The Holman Holtrac introduced at the Public Works Exhibition (1960) (see *The Mining Journal*, November 11, page 539), is a powerful, crawler-mounted drill rig, which, with a towed air compressor forms a self-propelled unit capable of being operated by one man. It carries an SL.160 Holman heavy drifter. The power unit, air operated through an eight plate Bristol tractor clutch is made up of two Holman 5R Rotomotors, each of 7½ h.p. capacity. Maximum track oscillation over all types of ground by means of an articulated action system, ensures stability and manoeuvrability under adverse site and quarry conditions. Laminated rubber track pads are supplied if required.

All hydraulic and pneumatic controls for the carriage are concentrated on one panel, while dual control for the drifter and the feed motor is provided at the slides.

Boom movement and feed positioning are finger-tip controlled and permit pattern drilling at almost any angle. The hydraulic movements include elevating, lowering and slewing of the boom, and dumping, swinging and crowding of the drill carriage. The reach is such that breast holes 8 ft. 9 in. up from ground level and spaced 7 ft. 6 in. apart can be drilled from one setting. For dry drilling effective dust suppression is achieved with a dust eductor unit which blows dust and chippings a safe distance away.



The Holtrac, a crawler-mounted drill rig, carries an SL.160 Holman heavy drifter

UTILITY VEHICLE

A new "do-anything, go-anywhere" vehicle combining features of a snow tractor, jeep and dukw, is the Canadian-designed Bombardier Muskeg tractor. It can climb snow-covered mountains, cross swamps, rivers or bogs, and can carry firefighting or other equipment through thick forest and bush.

The tractor was shown in Britain for the first time at the Public Works Exhibition at Olympia, London, from November 14-19, by Rolba Ltd., London, the European concessionaires for Bombardier Snowmobile Ltd., of Canada.

Above, at the top of page, the Bombadier Muskeg tractor. Immediately above, the damaged Texolex helmet from the Royal Arms opencast site

Available with a wide variety of personnel or equipment-carrying bodies, the Muskeg tractor is rubber tracked and has completely watertight chassis and bodywork. The tractor is fitted with a Perkins six-cylinder Six B.305 industrial diesel engine developing 88 b.h.p. at 2,400 r.p.m.

HELMET NEWS FLASH

Latest information on the standards achieved by British manufacturers of safety helmets is contained in a report of the protective properties of these equipments when used at an opencast coal site.

Although his safety helmet was battered, a drilling rig operator working at the bottom of a 60 ft. wall was unhurt by the fall of a razor-edged rock at the Royal Arms opencast coal site, near Merthyr Tydfil, recently. The rock fell between 50 ft. - 60 ft.

These Texolex helmets are made from cotton fabric impregnated with resin and high pressure moulded to give a light yet extremely strong helmet. The finish is good and the shells have a high impact resistance. The helmets are impervious to moisture and grease, will not become flabby due to water absorption and are non-conductors of electricity. The shells and the headcradles are scientifically designed to give the maximum protection and exceed the requirements of the various Standard Institutions throughout the world.

The blow transferred to the head through the headcradle assembly in the event of an impact on the shell is reduced to such a small foot poundage that wearers are usually unharmed.

MINING MISCELLANY

Coal deposits, estimated at 2,500,000 tons are officially reported to have been discovered in Greenland, and are said to be sufficient for the island's needs for the next 50 years.

★

Store Norske, the larger of the two Norwegian coal-mining companies on Spitzbergen, announces that it expects to have shipped 250,000 tonnes of coal from Longyearbyen before the port is closed by Arctic ice. Only some 10,000 tonnes of last season's output will be left on the island.

★

The Tasikmalaja branch of the Indonesian manganese ore undertaking plans to raise output at its Karangnunggal mine from 2,500 tonnes to 4,000 tonnes per month. The mine is the biggest manganese deposit in West Java and is believed to be the biggest in Indonesia.

★

The Soviet news Agency, *Tass*, reports the finding of new iron ore deposits claimed to be important in the eastern foothills of the central Urals.

★

At the request of the Federal German Ministry for Atomic Affairs, closer studies are being made of uranium deposits in the southern part of the Black Forest in south Germany, to ascertain whether the uranium could be economically mined, and its possible uses.

★

The Norwegian company, Christiania Spigervark, of Oslo, reports that production at its nepheline mine on the north Norwegian island of Stjernoy is to start in December. Some 90 per cent of the initial annual output of 50,000 tonnes will be exported, the other 10 per cent supplying the local glass and ceramics industry.

★

According to a recent special issue of the German financial paper, *Handelsblatt*, Burmese iron ore deposits are being examined by West German experts for their mining potential.

★

Japan is reported to be considering importing large quantities of iron ore from Angola. Japanese imports of iron ore from Goa are now at an annual rate of some 1,500,000 tons.

★

The Swedish state-controlled iron ore mining concern, Luossavaara - Kiirunavaara AB (LKAB), estimate their Norrland iron ore reserves at over 3,000,000,000 tonnes. The company is to spend 150,000,000 Swedish Kroner on a new ore port at Lulea, which will have an ore loading capacity of 600 tonnes per hour.

★

Burma is reported to have produced 730 tons of tin ore and concentrates during the mining year 1959/60 (1958/59, 859 tons); 12,000 (1,801) tons of tin-tungsten ore; 35,000 (33,636) tons of lead ores and concentrates; 22,240 (17,906) tons of zinc concentrates and 121,351,000 (114,664,000) gallons of mineral oil.

The Furukawa Mining Co., and the Mitsui Metal Industry Co., plan two new refineries for processing electrolytic copper in Japan; Furukawa in the Chiba prefecture, with a monthly capacity of 1,000 tons, and Mitsui, either in Chiba or in Sakai, western Japan, with a projected monthly capacity of 1,500 tons. Both plants would be constructed near ports to facilitate handling imported ores. Japanese requirements of electric copper in the financial year ending March 1961 are expected to total 240,000 tons, compared with 212,000 tons for the last financial year. Japanese smelters now consume as much imported ore as home produced, due to increased copper production, states the Mitsui Metal Industry Co., and the percentage of imported ores is likely to increase, as deposits of domestic copper are reported to be limited.

★

The Nippon Mining Co., which operates one of Japan's largest copper smelters, has been given an option to purchase the copper mine of the Cia. Minera Chapi, Peru. This mine, with reported reserves of 80,000 tons of 3.5 per cent copper ore, is 65 km. southeast of Arequipa. Nippon Mining is reported to be planning establishing a new mining company in Peru, with a capital of $3,500,000.

★

Export-Import Bank has allowed a $6,000,000 credit to the National Iron Ore Co., in Liberia, to aid development of iron ore deposits in the Mano River district. The company, which is partly state-owned, will purchase a total of $8,300,000 of U.S. equipment, materials and engineering services.

★

Gas Trunk Line of British Columbia, Ltd., has begun work on the first phase of a $93,000,000 natural gas pipeline system in north-eastern British Columbia. The pipeline, with an initial daily capacity of 350,000,000 cu. ft. which can later be increased to 650,000,000 is to be completed in December 1961. The 30 in. Trunk Line will extend 245 miles southward from the newly-discovered fields near Fort Nelson to connect with the existing Westcoast Transmission pipeline near Chetwynd. The Westcoast line, which now serves southern B.C. markets, exports surplus Candian gas to the El Paso Natural Gas Co. system, which extends through western U.S., as far south as Los Angeles.

★

Large deposits of lignite have been located in a recent survey undertaken by the Directorate of Geology and Mining of the Gujarat Government, India. High quality lignite was struck at a depth of between 300 and 600 ft. in the Jagadia area of Broach district, and also around the Bhuri area. Deposits around Jadaia are estimated at about 35,000,000 tons, and experts believe it would be possible to mine about 400,000 tons annually. The survey also revealed rich lignite deposits in an area of 200 sq. miles in Broach and Surat, and many other areas believed to stretch as far as the Pakistan border in the north.

The Greek Government is to form two limited liability companies. One is for exploitation of Greece's mineral resources and will be provided with adequate funds for modern drilling and other mining equipment, to enable it to undertake mining work for the state and private enterprises. The other is to undertake oil-prospecting work which is now being carried out for the state with the co-operation of Roumanian and French oil organizations. The search for oil, natural gas and minerals is stated officially to be continuing satisfactorily.

★

The first 4,000 tons of ilmenite, now available at the Mineral Science Corporation's factory at Pulmodai on the east coast of Ceylon, has not yet been marketed. The ilmenite plant went into production about four months ago, with an initial target of 15,000 tons a year. The factory has a minimum capacity of 60,000 tons.

★

The Hungarian alumina plant of Almasfuzito has a new crushing unit and other equipment costing 200,000,000 forints. The aluminium semi-products factory at Szekesfehervari Konnyufemmu has announced expansion plans which will cost 600,000,000 forints.

★

During the first nine months of 1960, 71,200,000 tonnes of iron ore were produced in the six countries of the European Coal and Steel Community, 9.8 per cent more than in the same period last year. By the end of the same period, hard coal dumps in the area had dropped to a total of 30,000,000 tonnes, compared with 32,800,000 tonnes a year ago. French coal dumps constituted 13,000,000 of this amount, and those of Federal Germany 9,100,000.

★

A new diamond field of small dimensions was recently discovered in South Kalimantan, near Bandjarmasin's Ulin airport, Indonesia. Among diamonds found was one of 12 ct. with an estimated value of 1,000,000 rupiah.

★

The Haifa Technion, Israel's Institute of Technology, is to inaugurate a three-year specialized course for the training of mining engineers to fill shortages caused by constant new expansion programmes.

★

The Geological Survey of Canada is continuing its programme of mapping and geological studies in Northern Canada and has 87 parties in the field this year, the largest field programme which it has so far undertaken.

★

The Nippon Mining Co. have announced plans to buy about 300 tons of copper ore or concentrates monthly from Australian mines in the Cloncurry district, and is negotiating with a local copper mining association for a long-term contract. It is planned to establish a purchasing centre in the area to collect the minerals from scattered mines for export to Japan. Nippon Mining Co. is

also stepping up development of copper mines in the Undo area of the Fiji Islands, where prospecting during the past year and a half had confirmed estimated deposits of 500,000 tons. If deeper borings now being undertaken proved successful, mining would start next spring of about 100 tons of copper concentrates monthly for shipemnt to Japan.

★

The German concern Demag has received an order to expand the state-owned Bhadravati steel works in Mysore, India, from an annual crude steel capacity of about 30,000 tons to 130,000 tons. The rolling capacity is also to be increased by the installation of a new reversing mill.

★

A post-graduate course, leading to the degree of Master of Science in Mining Engineering, has been established for the first time at the University of the Witwatersrand. The course, which will be combined with a research project of limited scope, will be introduced in 1961.

★

The National Commission of Mining Studies and Operations at La Paz, Bolivia, decided that a Russian proposal, made by Mr. Khrushchev recently in New York, to install a smelter in Bolivia would be impracticable. Metallurgists in Bolivia believe it would be more advantageous to instal washing plants, using as a basis hot hydrochloric acid to raise the exportable tin mineral ore content, rather than smelt the ore at high cost.

★

The directives for East Germany's current 7-year plan, ending 1965, emphasize the importance of maximum exploitation of indigenous mineral resources, and DM.2,000,000,000 has been allocated by the government for expenditure over this period on geological prospecting. It is stated that 170 modern drilling units and 350 turbo-drills are to be made available. Particular attention is to be given to possible oil and natural gas deposits, a target of 1,000,000 tonnes annually of mineral being set for the end of 1965.

★

The labour force employed in Malaya's booming iron ore industry rose by 10 per cent and output for the first five months of 1960, at more than 2,000,000 tons, was almost double that for the same period of 1959. Production during 1960, originally forecast at 4,000,000 tons is now expected to exceed 5,000,000. A Japanese team, representing steel corporations, has visited Perak, the second largest producer, to assess iron ore potential.

★

A private Japanese mission, headed by Mr. Naisho Hashimoto, president of the importing firm of Hashimoto Sangyo, is to visit South Korea shortly to explore the possibility of increasing Japanese purchases of Korean anthracite. The mission was invited by the Dai-Han Coal Corporation, South Korea's coal sales organization. The South Korean coal industry has requsted Japan to buy 500,000 tons of anthracite-smokeless fuel for industrial uses. Total Japanese imports of anthracite are estimated at 680,000 tons for industrial uses and 180,000 tons for the manufacture of briquettes during the current financial year (April to May).

It is reported that some 300 deposits of uranium have been discovered in the Spanish Province of Salamanca, as a result of exhaustive researches by technicians of the Spanish Nuclear Energy Board.

Company News

The General Electric Co. has been awarded a £50,000 order from the East Rand Engineering Co. of Johannesburg for equipment including switch and control gear, to be used in the conversion of a winder from steam to electric drive. The converted winder will be installed underground at the Withok gold mine of the S.A. Land and Exploration Co., a member of the Anglo American group.

★

Laporte Industries announce the purchase from Head Wrightson and Co., of the whole of the issued capital of The Cupola Mining and Milling Co. The Cupola company is engaged in the treatment of fluorspar and barytes, and Laporte intends to meet the rising demand for acid grade fluorspar by expanding production at the flotation plant at Stoney Middleton, Derbyshire, which has recently been installed by Head Wrightson & Co. The operations of the Cupola company will be integrated with those of Glebe Mines, another Laporte subsidiary engaged in similar operations in the same area.

★

Howe Sound Co. have bought all the outstanding stock and plant facilities of the Combined Smelting and Trading Corporation of Sewaren, N.J., U.S.A.

★

Mirrlees Bickerton and Day is to supply Mines de Fer de Mauretanie (Miferma) with diesel generator sets to the value of £460,000 for the entire electric power supply to the new Mauritania (French West Africa) mines and port handling facilities. (See *Mining Journal* Sept. 9, p. 282).

★

Joy-Sullivan Ltd. of Greenock are to handle the provision of sales, spares and servicing facilities throughout the British Isles for the Joy-Hazemag impact crusher, manufactured by the Hazemag m.b.H., of Munster, Westphalia, W. Germany. Manufacture of spare parts will commence immediately in this country and in the near future the complete units will be made here.

★

Dowty Group announce the formation of a new company to undertake advance project work for the group. The new company, Dowty Technical Developments, brings the total number of Dowty Group subsidiary companies to 22. Chairman of Dowty Technical Developments is Sir George Dowty, and Mr. T. D. H. Andrews is managing director.

★

The Heavy Plant Division of Associated Electrical Industries has received orders worth over £230,000 from the National Coal Board, and from the Union Corporation South Africa.

The Glacier Metal Co. have recently extended their Manchester factory by some 10,000 sq. ft., and equipped it with special purpose heavy machines to undertake the repair and manufacture of an increased range of large whitemetal plain bearings, which can now be manufactured from 1 in. to 5 ft. dia.

★

Buell Ltd. have received instructions from Head Wrightson Iron & Steel Co., main contractors for the new development "Temper" at the works of Appleby-Frodingham Steel Co., Scunthorpe, for the supply of three Buell rotary drum dryers. The dryers, which will be manufactured by the parent company, Edgar Allen & Co., will handle up to 130 tons per hour input of Northamptonshire iron-ore, and are similar to those supplied to Appleby-Frodingham Steel Co., in 1948 in their "Apex" project. All the plants will be erected by Buell's erection department.

EXPANSION OF IRON ORE RECOVERY PLANT

The International Nickel Company of Canada, Limited, will proceed immediately with the expansion of its iron ore recovery plant at Copper Cliff, Ontario, tripling its capacity, according to an announcement made in Toronto by Henry S. Wingate, chairman of the Board.

"Using a process invented by the company's research staff and successfully established in its existing iron ore recovery unit, the expanded plant will treat 1,200,000 s.tons per year of nickeliferous pyrrhotite high in iron content," Mr. Wingate said. "The process involves solid state pyrometallurgical operations, and the removal of nickel by atmospheric pressure leaching, in high-capacity units of novel design.

"The diversion of this large quantity of pyrrhotite to the expanded iron ore recovery plant will effect a 40 per cent decrease in the tonnage of material which otherwise would have to be handled by the nickel section of the Copper Cliff smelter. The change in practice in the nickel smelter will result in important smelting economies and provide a basis for further major advance in nickel extractive metallurgy.

"In the iron ore recovery plant, capacity for the output of iron ore pellets containing 68 per cent iron, which have established a high reputation for quality, will be raised to 900,000 s.tons per year and more nickel will be recovered from the same amount of pyrrhotite than is now possible in the nickel smelter.

"The expanded plant is scheduled to be in full operation in 1963. It will entail a total estimated capital outlay of $50,000,000, of which up to $10,000,000 is scheduled for 1961.

"The project is another milestone in the company's intensive research efforts to achieve maximum utilization of the many elements found in its Canadian ores.

"The company is confident that the strong and growing demand for high-grade iron ore, particularly in the United States, will assure an outlet for the entire tonnage of Inco's premium iron ore pellets."

Metals and Minerals

U.S. Titanium Industry Regains Lost Ground

At the beginning of this year it was anticipated that the 1960 volume of titanium production in the U.S. would be approximately in line with that of 1959. However, as reported in our issue of June 17, p. 715, production of titanium mill products during the first quarter at 1,938,515 lb. showed a gain of 16 per cent over the total for the corresponding quarter of 1959.

This improvement has been progressive and is still continuing. According to the U.S. Department of Commerce, U.S. titanium mill production in August totalled 963,908 lb., compared with 606,238 lb. in July and 295,325 lb. in August, 1959. Ingot production in August was 1,485,284 lb. compared with 1,123,411 lb. in the previous month. Domestic consumption of ingots in August amounted to 1,447,490 lb., compared with 1,246,234 lb. in July.

Using as a yardstick the production of ingot, it is noteworthy that the August output of 1,485,284 lb. was equivalent to an annual rate of some 8,900 s.tons, which compares with 6,017 tons in 1959, 5,480 tons in 1958, 10,009 in 1957, and with the peak production of 11,688 tons in 1956. Assuming that the level of production in August, 1960, is at least maintained, it would appear that the industry has regained well over half the ground lost since mid-1957, when U.S. military requirements for titanium were cut back.

A report in the *American Metal Market* states that titanium metal producers, as well as stainless steel producers, are taking a cautious view of the B-70 bomber as a market for metal, although initial "calls" for material to meet the new production schedules have been made. If the present schedule holds, it seems that increasing amounts of metal will be procured throughout 1961 with the market peak in the second quarter of 1962.

About 85 per cent of the metal used in the construction of the B-70, which, with fuel, has a gross weight of about 400,000 lb., is stainless steel. The severe weight penalty from steel is believed to be pushing design interest more and more towards titanium. One aircraft designer claims that it is worth about $200 to save a lb. of weight in this aircraft. The B-70, which is designed to cruise at 2,000 m.p.h. at altitudes of 70,000 ft., employs stainless steel wings and mid-section. Titanium is used in wing forgings, the forward cabin section and empennage. Some parts of the J-93 engine are made from both titanium and super alloy steels.

Earlier this year it was reported that a new titanium alloy, having good strength and resistance to rupture and creep at higher temperatures than previously available, had been commercially developed by Titanium Metals Corp. It was claimed that the new alloy, which contains 8 per cent aluminium, 1 per cent molybdenum and 1 per cent vanadium, extended titanium's use in jet engines from about 650 deg. F. to 900 deg. Titanium alloys in unstressed airframe parts can be used to 1,000 deg. F.

RATIONALIZATION OF JAPANESE NICKEL INDUSTRY

A report from Tokyo states that the Japanese Ministry of Trade is urging the Japanese nickel industry to step up its rationalization to prepare for the liberalization of nickel imports. An extensive rationalization programme is required to reduce the wide difference in the domestic nickel production cost and the world market level. Prices of domestically produced nickel are at present about 1,150,000 yen per ton, compared with the c.i.f. price of about 600,000 yen per ton for imported nickel.

The rationalization programme under consideration is designed to reduce the prices of domestically produced nickel to about 850,000 yen per ton by 1965. To achieve this aim, the Japanese nickel industry would have to switch the source of nickel ore supply from New Caledonia to nickel sulphide ore in Canada and Africa.

During the period from 1961 to 1965, the domestic output of nickel would be restricted to 6,000 tons from the present 9,600 tons, any deficiency being covered by imports of nickel metal, which would be liberalized in 1961 or 1962 under a tariff quota system. Under the programme, the specific duty on nickel metal would be 350,000 yen per ton in 1961 and 1962, 300,000 yen in 1963 and 1964, and 200,000 yen after 1965.

U.S. ANTIMONY PRICES RISE

U.S. prices for imported antimony were increased at the beginning of November by ¼ c. per lb. Quotations for five-ton lots, duty paid New York, are currently: 99.6 per cent grade, 26.75-27.5 c. per lb.; 99.5 per cent, 26.25-26.75 c. and 99 per cent grade, 25.75-26.25 c. It will be recalled that in the U.K. higher antimony prices were announced in September, representing the first revision upwards since November, 1957.

The rise in U.S. prices for imported metallic antimony is attributed to the growing demand for oxides, particularly from the plastics industry. The increase in oxide production, it is stated, is reducing the quantities of ore available for output of antimony in metallic form. As a result, available supplies of imported primary metallic antimony have tightened. The use of antimony oxides as a flame-proofing agent by the plastics industry is regarded as a promising avenue for future growth. Indeed, the view has been expressed that plastics might some day be the biggest outlet for antimony.

LONDON METAL AND ORE PRICES, NOV. 17, 1960

METAL PRICES

Aluminium, 99.5%, £186 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £200 per ton
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 10s. 6d. lb.
Cerium (99%) net, £15 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 12s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram
Gold, 253s. 6d.
Iridium, £20/£23 oz. nom.
Lanthanum (98%/99%) 15s. per gram.
Magnesium, 2s. 2½d./2s. 3d. lb.
Manganese Metal (96%/98%) £275/£285
Nickel, 99.5% (home trade) £600 per ton
Osmium, £18/£22 oz. nom.
Osmiridium, nom.
Palladium, Imported, £8 12s. 6d.
Platinum U.K. and Empire Refined £30 5s.
Imported £28½/£28¾
Quicksilver, £70½ ex-warehouse
Rhodium, £43/£45 oz
Ruthenium, £14/£16 oz. nom.
Selenium, 46s. 6d. per lb.
Silver, 79½d. f. oz. spot and 79½d. f'd.
Tellurium, 28s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis	21s. 6d./22s. 6d. per unit c.i.f.
Beryl (min. 10 per cent BeO)	240s./245s. per l. ton unit BeO
Bismuth	65% 8s. 6d. lb. c.i.f.
	18/20% 1s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable 48%) (Ratio 3 : 1)	£15 5s. 0d. per ton c.i.f.
" Hard Lumpy 45% (Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
" Refractory 40%	£11 0s. 0d. per ton c.i.f.
" Smalls 44% (Ratio 3 : 1)	£13 5s. 0d. per ton c.i.f.
Baluchistan 48% (Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1) Nb_2O_5 : Ta_2O_5	175s./176s. per l. ton unit c.i.f.
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)	156s. 0d. ex. works
Lithium Ore—	
Petalite min. 3½% Li_2O	50s. 0d./55s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O	50s. 0d./55s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O	75s./85s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore Indian—	
Europe (46%-48%) basis 60s. 0d. freight	73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)	69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)	nom.
Molybdenite (85%) basis	8s. 11d. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO_2 (prompt delivery)	£28 0s. 0d. per ton c.i.f. Aust'n
Ilmenite 50/52% TiO_2	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	148s. 0d./153s. 0d. per unit c.i.f
Vanadium—	
Fused oxide 95% V_2O_5	8s./8s. 11d. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 65-66% ZrO_2	£16/£16 10s. ton c.i.f

KAISER CLOSES ANOTHER POTLINE

Kaiser Aluminium is to shut down another of the nine potlines at its Chalmette, Louisiana, aluminium metal reduction plant. The curtailment is the third at Chalmette this year, the other two having been shut down in August and September respectively. Kaiser has also closed four of the eight potlines at its Mead, Washington, reduction plant. In announcing the latest shutdown, the company said that the objective was to make further adjustments to plant inventories of primary aluminium.

EUROPEAN METAL CONSUMPTION

If industrial development in Europe continues at the present rate, consumption of non-ferrous metals in Europe will soon outgrow that of the U.S., states Metallgesellschaft A.G. in its annual statistical report. In 1959, consumption of non-ferrous metals in the European Common Market and the European Free Trade Association already equalled that of the U.S. This rise in the consumption of metals is ascribed to the increase in the European production of motor vehicles, and long-life consumer goods and in the building industries.

The report also emphasizes the importance of aid to under-developed countries to the metal industries of the world. Many of the under-developed countries were leading metal producers, it was pointed out, and it could safely be assumed that metal consumption would increase in many of them.

INDIA'S MANGANESE CRISIS

Over 250 of India's manganese mines have been closed owing to uneconomic conditions in Madhya Pradesh, according to Mr. B. Thacker, chairman of the Mineral Industries Association. "Unless the government takes all possible steps to reduce the burden of levies," said Mr. Thacker, "the position will further deteriorate and it is certain that more mines will close down."

The statement added that the export of manganese ore from India had declined in value from Rs. 136,100,000 to the present level of Rs. 119,800,000. This was ascribed primarily to increased competition from Brazil, Ghana and the U.S.S.R., but also to a "marked failure" by the government to take active steps to enable the industry to be effectively competitive on the international market.

★

Uneventful trading conditions continue to characterise the ore market and prices remain quotably unchanged. This does not, however, imply that the general level of consumption of ore is poor. On the contrary, it is probably still quite good, having regard to the continuing activity in the steel industry outside the U.S. In the absence of any indication, however, that prices are likely to rise, consumers are presumably content to await developments and carry on with supplies forthcoming under contracts. Purchases for marginal requirements and for next year are thus disappointing, although it is understood that the U.K. will be considering closing contracts for 1961 next month.

The steel industry in the U.S. remains depressed and as yet there are no signs of even a moderate recovery. In July, last month for which Bureau of Mines statistics are available, U.S. imports of manganese ore containing 35 per cent or more manganese totalled 202,485 s.tons, a decrease of 41 per cent from June. Imports of ferromanganese at 45,678 s.tons of ore equivalent were 2½ times those of June. In the same month domestic mine shipments of manganese ore rose by 55 per cent to 6,800 s.tons. On July 31, industry stocks of manganese ore totalled 2,482,096 s.tons compared with 2,414,189 tons at the end of June.

In the U.K. imports of ore from all sources during September amounted to 63,151 tons, raising the total for Jan.-Sept. to 394,178 tons, compared with 256,073 tons in the corresponding period of last year.

POTENTIAL REACTOR MATERIALS

A report by R. F. Dickerson, reactor metallurgist at the Battelle Memorial Institute, presented at the Atomic Energy Commission Joint Conference organized by the American Society for Metals states that uranium mononitride, uranium sulphide and uranium silicides are potential reactor materials which could handsomely reward increased research. Because of the advanced state of their technology, uranium dioxide and uranium carbides were mentioned as having the greatest potential at the present time. However, the view is expressed that the three compounds previously mentioned could well be developed into reactor fuels which would help to provide economic nuclear power. Uranium beryllide should also be considered as worthy of expenditure on research and development, even though it would only be suitable for use in a compact reactor system. Uranium borides prepared with Boron-II should also be seriously considered.

★

The directors of Société Métallurgique de Hoboken state in their annual report that uranium processing is to be suspended by the company, due not to any shortage of supplies but to the ending of the contract with the U.S. Atomic Energy Commission. The company is the sole Belgian producer of metallic uranium and its chief compounds.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

The week has been marked by great activity in the copper market in which the turnover on Monday was the highest for a long time, exceeding 4,000 tons in the official morning market and with a total tonnage for the day in excess of 6,000 tons including the two kerb markets. It is to be noted that the large morning tonnage took place within a price span of only 15s.

COPPER PRICES EXPECTED TO ADVANCE

The undertone of the copper market remains very firm, and with the establishment of an appreciable backwardation all the indications are that prices will move higher before the end of the year even if large scale buying for tax purposes does not occur. It is interesting to note that the backwardation has developed in spite of a continuous increase in stocks which again rose on Monday by a further 553 tons, giving a total of 11,208 tons; it must be assumed that the majority of this is in firm hands and is unlikely to affect the market unless the backwardation increases still further. The strengthening price tendency outside the U.S. was underlined last week when the U.M.K. price was raised 70 points to the equivalent of 28.10 c. per lb. New York or Antwerp.

The unexpectedly sudden settlement of the strike at Chuquicamata over the weekend was probably the main reason for the large turnover on Monday at a price below that ruling at the end of last week, but early in the day it became obvious that with the change of sentiment bears were prepared to cover large tonnages with any drop back in the market. This factor prevented a large decline and laid the foundations for a further advance in the market. It is understood that the settlement was for a general 25 per cent increase in wages without bonuses or other fringe benefits, but at the time of writing the details of the agreement have not yet become known. The production will probably not be in full swing until the end of the month, and it is estimated that the total loss will be in the neighbourhood of 40,000 tons of copper.

The Copper Institute's figures for October show that in the United States production of refined copper remained constant at 151,497 s.tons as against 147,934 s.tons in September, whilst domestic deliveries showed a sharp drop at 93,451 tons as compared with the September figure of 120,585 tons, and stocks showed a corresponding rise at 113,417 tons as compared with 84,316 tons. In conjunction with these figures it should be remembered that deliveries in September showed a sharp rise and it seems possible that the figures may be dislocated by deliveries made over the turn of the month as the comparable figures for the last three months are; for August 105,417 tons, for September 120,585 tons, and for October 93,451 tons. The stock figures, however, underline the fact that the over-production in the U.S. continues.

Outside the United States the Chuquicamata strike is reflected in a reduction in production of refined copper, the monthly figure being 156,901 tons as compared with the September

total of 174,641 tons. Deliveries to fabricators in October showed a sharp decline at 187,081 tons as compared with 208,075 tons the previous month. End of month stocks remained pretty well unchanged at 294,735 tons as compared with 294,524 tons.

TIN SHOULD ALSO GO HIGHER

The tin market, after a few days of weakness, showed signs of recovery immediately relatively heavy selling from one quarter dried up. The general opinion of the market still is that the price will go higher and with demand from both sides of the Atlantic remaining at a good level the upward movement may not be long delayed. It became known during the week that the Malayan Government had agreed to ratify the new tin agreement but so far there has been little news of other similar decisions.

On Thursday the Eastern price was equivalent to £802⅜ per ton c.i.f. Europe.

UPWARD TREND ANTICIPATED FOR LEAD-ZINC

The lead and zinc markets have both been uncertain, but most observers now think that the long-term trend is once more in an upward direction due to the influence of a multitude of small factors which have not been worthy of special note. The major event noticed on the market was the elimination of the backwardation on zinc at the end of the half-monthly period. This may represent the arrival of metal to be put into warehouse in preparation for the new contract commencing on January 1, which is on an ex-warehouse basis. The latest figures from the Bureau of Mines in the U.S. indicate that during 1960 the tariff and quotas on lead have been sufficient to enable the domestic producers to continue operations, the January to September total of recoverable lead being only 3 per cent below the comparable period for 1959 at 184,400 s.tons.

The American Zinc Institute's figures for October were disappointing in view of the continued hold-up in production at both Bunker Hill and New Jersey as the end of month stocks only declined about 2,000 tons at 190,288 tons as compared with 192,466 tons a month earlier. Domestic shipments showed some slight improvement but with exports lower the total shipments were 65,183 tons against 68,182 tons.

Closing prices are as follows:

	November 10		November 17	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£227¼	£227½	£225¼	£225½
Three months ..	£227¼	£227½	£224¼	£225
Settlement ..	£227½		£225½	
Week's turnover	14,450 tons		14,500 tons	
LEAD				
Current ½ month	£69½	£69¾	£67¾	£68
Three months ..	£69¾	£70	£68⅛	£68⅜
Week's turnover	6,225 tons		7,600 tons	
TIN				
Cash	£799½	£800½	£802	£802½
Three months ..	£797½	£798	£798	£799
Settlement ..	£800½		£802½	
Week's turnover	920 tons		535 tons	
ZINC				
Current ½ month	£88½	£89	£86½	£86½
Three months ..	£87½	£87½	£86⅜	£86⅜
Week's turnover	5,850 tons		7,175 tons	

Mining Finance

Big Rise in Rhokana's Output

The profits and dividends for the Rhodesian Anglo American group of copper mines were detailed here on October 14 last. The annual reports and chairman's statements are thus of particular note for the output figures and other technical details that they reveal, there being no quarterlies from this group as a guide in these respects. Rhokana's Nkana mine stepped up its production sharply in the year to June 30 last. Output of blister copper was not greatly changed at 27,120 tons against 26,129 tons in 1958-59, but electrolytic output jumped from 50,854 tons to 76,861 tons making the total a record 103,981 tons compared with only 76,983 tons in the preceding year.

There may, of course, be a different picture for 1960-61 because, along with other western world copper producers, the Rhoanglo group has agreed as from October to hold 10 per cent of its production off the market. This is to be done in the first place, so far as this particular group is concerned, by cutting sales but not production. As Mr. Harry Oppenheimer explains, this enables producers to establish reasonable stocks from which they can supply the market in times of shortage and so help to prevent the price running away. This method also, of course, helps to keep down unit mining costs.

Rhokana holds 9,543,509 Bancroft Ordinary as well as 1,500,000 Preference. It should be noted that the maiden dividend (see below) together with the participating rights on the Preference will fall in Rhokana's current financial year to next June. These items represent income of £520,000. Rhokana's holdings in Nchanga and Mufulira brought in considerably more revenue in 1959-60, investment income after tax jumping from £2,042,457 to £4,222,350. Mining profit was more than doubled at £7,311,928 so that, as previously announced, the net surplus was also slightly more than doubled at £11,534,278 of which Rhokana's dividends absorbed £8,750,007.

BANCROFT'S POSITION

The group's newest producer, Bancroft, produced 51,121 tons of copper in the year to June against only 12,156 tons in 1958-59 during which period the mine did not re-open after its shut-down until April 1, 1959. Bancroft is also joining the current cutback scheme. But it is taking steps to increase its mill rate. This is currently about 150,000 tons of ore a month and it is planned to raise this to 170,000 tons, but the extra tonnage will be drawn from development work at the Kirila Bomwe north orebody and because of dilution by waste rock this development ore does not usually contain so much copper as that obtained by stoping. Of the present 150,000 tons some 30,000 tons also come from development work.

Naturally at this early stage in its career development and exploration work is still going on apace at Bancroft and further increases are expected in the ore reserves which at present stand at 105,000,000 tons averaging 3.73 per cent copper.

Financially, the Bancroft position is that after allowing for the maiden dividend of 1s. net of Rhodesian tax there is a carry-forward of £807,065 which has been used to whittle down the debit balance from the preceding year which is thus reduced to £2,024,974. As previously announced, the company can now get extra funds of £2,625,000 by calling on option holders to take up 3,000,000 Bancroft shares of 5s. each at 17s. 6d., a price that compares with the current market level of 15s. 9d.

A loan of £5,000,000 is repayable by the end of next month, but it looks as though Bancroft will exercise its right to turn this into an equivalent amount of 15- to 20-year Notes or Debentures. The lenders are Anglo American Corporation and the British South Africa company.

PRICES AND POLITICS

The average price received by Rhokana for its copper sales of 103,863 tons was £242 a ton which compares with £218 in 1958-59 and with the current London quotation of £226. Taking this price element into account along with the sales cutback the outlook for these copper concerns in 1960-61 is less rosy and at the moment there seems little chance of repeating the 1959-60 results which were the best since the record year of 1956 when the metal averaged about £371 a ton.

It is, however, largely the Rhodesian political risk that is now depressing share prices. In his Rhodesian Anglo American statement Mr. Harry Oppenheimer deals at length with this aspect of the situation, largely repeating for the benefit of shareholders the speech he made at the beginning of the month to the Royal African and Royal Commonwealth Societies. There are grounds for hope in what he says, but first there are likely to be some difficult times ahead for the Federation. Meanwhile, uncertainty is always the bane of share markets.

WAGE INCREASES HIT GHANA GOLDS

The accompanying table summarises the operating results of the Ghana gold producers for the September quarter. Unfortunately the details given in the official publications are insufficient for such a table to be carried to its logical conclusion, as can be done for the South African producers, namely the calculation of earnings per share per annum after tax. It is to be hoped that one of these days the Ghana companies will fall into line with the Rand in this respect.

Profits of the Western Selection group mines, Amalgamated Banket Areas, Ariston, Bremang and Ghana Main Reef, make a poor showing for the past quarter. This is partly due to the inclusion for the period of the extra amounts involved in the statutory wage increases imposed on the country's industries including the gold mines by the Ghana Government with effect from July 1 last. (The Western Selection Quarterly Report is on page 575.)

The following are the extra amounts involved for these four mines in the quarter; Amalgamated Banket £24,620, Ariston £19,257, Bremang, £5,000 and Ghana Main Reef £6,512. It is no wonder that the

GHANA GOLD QUARTERLIES

	Year ends	Quarter	Tons milled (000)	Ounces (000)	Grade dwt/ton	Cost per ton s.	Cost per ton d.	Working profit (£000)	Govt. duty (£000)	Net Profit Before Tax (£000)
Amalgamated Banket	S	Dec.	181·5	42·0	4·6	47	8	90·5	*a*	*a*
		Mar.	182·0	39·3	4·3	48	0	52·9	*a*	*a*
		June	168·0	38·1	4·5	50	5	51·0	*a*	*a*
		Sept.	156·7	36·1	4·6	57	3	1·6	*a*	*a*
Ariston	S	Dec.	120·8	39·8	6·6	56	6	153·5	*a*	*a*
		Mar.	121·1	39·3	6·5	55	8	151·7	*a*	*a*
		June	122·4	38·2	6·2	54	8	139·4	*a*	*a*
		Sept.	118·5	35·7	6·0	60	7	84·5	*a*	*a*
Ashanti	S	Dec.	112·5	91·8	16·3	72	5	741·5	98·6	445·5
		Mar.	106·5	88·2	16·6	74	8	707·2	82·6	449·5
		June	107·0	87·7	16·4	77	6	682·1	79·8	431·3
		Sept.	109·5	89·6	16·4	74	5	717·5	89·9	452·1
Bibiani	S	Dec.	93·5	21·2	4·5	41	8	70·3	—	20·6
		Mar.	95·0	21·0	4·4	42	2	62·8	—	12·2
		June	97·0	20·7	4·3	40	7	62·1	—	10·3
		Sept.	99·0	21·2	4·3	41	3	61·2	—	8·6
Bremang	D	Dec.	2687·3*	16·7	3·2†	1	0‡	75·8	*a*	*a*
		Mar.	2663·8*	15·5	3·0†		10‡	81·2	*a*	*a*
		June	2717·1*	16·9	3·2†		11‡	83·2	*a*	*a*
		Sept.	2920·3*	14·6	2·4†		10‡	61·9	*a*	*a*
Ghana M.R.	J	Dec.	35·7	12·4	7·0	64	11	39·0	*a*	*a*
		Mar.	36·8	12·6	6·8	60	4	45·3	*a*	*a*
		June	33·3	13·1	7·8	68	2	49·1	*a*	*a*
		Sept.	34·0	12·6	7·4	73	2	32·3	*a*	*a*
Konongo	S	Dec.	20·0	11·1	11·1	104	6	33·4	0·7	32·7
		Mar.	21·0	10·6	10·1	102	6	24·0	1·3	22·6
		June	21·8	10·6	9·7	99	6	23·0	—	23·0
		Sept.	21·9	10·3	9·4	98	10	19·6	—	19·6

Footnotes: * Cu. yds. dredged † Grains per cu. yd. ‡ Per cu. yd. *a* Not available

The cost per ton and profit figures for the Sept. quarter for all mines other than Konongo, have been provisionally adjusted to take account of the new increase in African wages with effect from July 1, 1960.

Ghana Chamber of Mines is currently making urgent representations to the government there to mitigate the effect of these wage increases, anyway on the marginal mines such as Amalgamated Banket and Bibiani. It is unlikely that the government would wish to see these concerns close down. Taquah and Abosso was lost in somewhat similar circumstances a few years ago.

Other adverse factors in the September quarter included heavy flooding on the Offin river which hampered Bremang's dredging operations, and continued grade control difficulties at Ariston. This mine is also having to undertake a major shaft repair. Movement of strata in the vicinity of the Central shaft between the 10th and 12th levels is necessitating the provision of stronger steelwork in this section of the shaft. The repair should be completed during the first quarter of 1961, but it is stated that output may be affected during the interim period.

CAPITALIZATION ISSUE FROM C.A.S.T.

The year to June 30 last was a good one for Consolidated African Selection Trust which is a Selection Trust group company that produces diamonds from Sierra Leone and Ghana. Higher revenue from diamond sales effected by the subsidiary Sierra Leone Selection Trust is the official reason put forward for the increased earnings. Pending the full report on November 25 it is fair to guess that the gradual winning of the battle against smuggling in that country may have had something to do with this.

Apart from a higher profit and dividend C.A.S.T. is also once again making a major capitalization issue. The last was one for one in 1957. Now it is proposed that £1,516,554 be taken from capital reserve account to enable 6,066,218 Ordinary 5s. shares to be issued to holders in the proportion of one for every two held. The new shares will not rank for the final dividend of 2s. 9d. which makes 3s. 6d. for the year, 3d. more than for 1958-59. The total distribution involves a pay-out of £1,300,446 from a net profit of £1,605,000 which compares with £1,320,134 in the preceding year. On the present occasion £200,000 against nothing is transferred to reserve and £737,032 against £632,478 is carried forward.

The fully-paid share issue will raise the capital from £3,033,109 to £4,549,663. It is unlikely that the company will be capable of maintaining the dividend on such a sharply increased capital although C.A.S.T. should still be doing well in view of the continuous high level of world diamond sales. At 26s. cum dividend the present yield is 14.4 per cent.

WANKIE HOPES TO MAINTAIN DIVIDEND

Mr. Keith Acutt, the new chairman of Wankie Colliery, the Rhodesian coal concern in the Anglo American group, is able to take much the same view of prospects as his predecessor, Mr. Tom Coulter. Namely that, although the increasing power resources of the big Kariba hydro-electric scheme will be cutting into the demand for the company's coal for thermal generation, it is hoped that, with the assistance of rising investment income and drawings if necessary on unappropriated profits, it will be possible to maintain the 1s. 3d. dividend rate during the period of falling coal sales. Further industrial expansion in the Federation will, it is believed, eventually maintain coal sales at a "reasonably satisfactory level".

In the year to August 31 Wankie's net profit of £1,084,060 amply covered the distribution which absorbed £659,726. The 10s. shares are 9s. 7½d. to yield 13 per cent.

(Chairman's statement is on page 580).

NO CAPITAL REPAYMENTS

Chairmen's statements from the Central Mining group gold mines that ended their financial years on June 30 (p. 578) are chiefly notable for the decisions of those rapidly waning concerns, Modder East and Consolidated Main Reef, not to make the capital repayments that had been hoped for by private shareholders in the U.K. Instead they are to continue dividends which are taxed in the hands of these holders.

The reason put forward is that the largest shareholders in these mines are public companies and that dividends are not only tax free to them but are also available for redistribution to these companies' shareholders. Repayment of capital, on the other hand, would ordinarily be applied to reduce the value of the investments and would not be utilised for dividend purposes.

On the face of it this news makes these particular shares less attractive, particularly to U.K. investors, as break-up propositions. In the recent appraisal of such shares made by a firm of jobbers in the Kaffir market it was noted that opposition to capital repayments by Modder East was believed to come from "a very large institutional investor in the Cape who prefers dividends". Central Mining points out that if the group had decided to go ahead with capital distribution the approval of shareholders might not have been obtained to the degree required by law.

As from early next month, Modderfontein East's monthly mill rate will be cut from 130,000 tons to approximately 52,000 as the mine is no longer able to produce sufficient payable ore to maintain the present rate. By this arrangement the mine is expected to be able to continue at a small working profit for a further limited period. The mine gave the statutory three months' notice of the possible curtailment or shutdown of operations last February and at June 1960 the ore reserves were reported at 408,000 tons averaging 3.9 dwts. over 40 inches.

In his recent annual statement the Chairman points out that Modder East will continue to make dividend payments rather than the capital repayments which are more usual towards the end of a mine's life. This is because Modder East's capital is widely held by South African public companies in whose hands dividends are tax free, but who would, if they received capital repayments, ordinarily apply these to writing down the book value of the investment—a process which no doubt has already in many cases taken place.

SUNGEI BESI AND AYER HITAM

Recent good tin company results have been added to by those of Ayer Hitam and Sungei Besi. The former for the year to last June brings its dividend up to an equivalent of 1s. 2.7d. per 5s. share on the present capital against a comparable 4.8d. a year previously. The distribution takes £228,846 from a net profit of £231,357. Sungei Besi is paying 10.8d. per 4s. share against 8d., requiring a pay-out of £81,696 from a net surplus of £103,832.

Both shares give modest yields on the basis of the latest payments. Ayer Hitam are 23s. 3d. cum 4½d. gross final dividend and Sungei Besi 23s. 9d. cum 3d. final. But both concerns have big expansion possibilities now that output restriction has ended, Ayer Hitam because of its additional dredge, which should now be able to show its full economic paces, and Sungei Besi because of its big open-cast potentialities following last year's merger with Hong Fatt.

National Mining.—National Mining's net profit after tax for the year to March 31 last totalled £62,759 or almost exactly double the figure for the previous year. On the strength of this a final dividend of

2½% has been declared making a total of 7½% for the year and at the same time an interim of 5% has been declared with respect to the current year. Both dividends are payable on December 9. National Mining's return to the dividend list after three years' absence reflects the fact that this is nowadays a portfolio company with a spread of mining and industrial investments through four Continents. The shares stand at about 2/6d. to yield 7½% on last year's dividend rate.

Rooiberg's lower profit.—Rooiberg Minerals Development, the South African tin producer, recorded a lower net profit after tax for the year to June 30 last at £75,602 (£98,513). Dividend distribution for the year was also lower at 17½% (22½%) on the £1 shares.

New Guinea Goldfields.—This company's profit for the year to June 30 last shows a decline at £A40,179 (£A62,639 in the previous year). As last year a dividend of 3d. (Australian) is to be paid from the Gold Mining Profits Reserve.

Rand Selection pays same.—With a final dividend of 1s. 9d. for the year to September 30 last, Rand Selection has kept its distribution for the year unchanged at 2s. 9d. The Corporation's taxed profit for the year to September 30 last totalled £1,378,000 against £1,559,335 in the previous year. An amount of £241,000 has been transferred to reserves bringing this figure to a total of £7,774,000.

Good response to De Beers Industrial issue.—Unlike some other recent South African issues, the De Beers Industrial Corporation's recent offer (*M.J.* September 16 last) of one new £1 share at £2 for every four shares held has been taken up as to over 90 per cent of the shares.

South African Townships.—Net profit after tax for South African Townships, Mining and Finance for the year to September 30 last amounted to £399,770 against £462,744 in the previous year. £50,000 has been transferred to the general reserve which now stands at £550,000. The dividend for the year remains unchanged at 1s. 6d.

Inco's nine month earnings.—For the first nine months of 1959 International Nickel report earnings per share amounting to $2.14 compared with $1.99 in the corresponding period a year ago. Whether Inco's earnings on the full year will show any improvement over 1959 remains to be seen as earnings in the last quarter of 1959 amounted to 92 cents per share. Since then quarterly earnings have shown a gradual decrease with 85 cents in the first, 65 cents in the second and 64 cents in the third quarter of this year. Latterly dividend payments have been at the rate of 37½ cents per quarter. (All the foregoing figures are adjusted to take account of the two for one share split of last April.)

Rio Algom's Quarterly results.—The results for the first quarter of the current year for the Rio Algom group of Blind River uranium producers reveals that adjustments are now being made in the current accounts to provide a reserve against future periods when contract deliveries to Eldorado Mining and Refining will be at lower prices. Group profits before making this provision for the quarter to September 30 last amounted to $5,016,000 against $3,840,000, which was the combined profit of the mines in the group in the corresponding period of last year, prior to the merger. $2,346,000 have been set aside out of last quarter's profits as a reserve against reduced profits from lower prices, leaving a net profit of $2,670,000.

LONDON MARKET HIGHLIGHTS

For the first two days of the week, South African Gold shares did little more than steady themselves after the reaction that had followed the previous week's short-lived upsurge on news of Mr. Kennedy's U.S. election victory. The steady dwindling in the daily fixing price for gold did not help matters and the few buyers about tended to concentrate on the Finance shares.

But in the later dealings on Wednesday the market suddenly became alive again. No very firm reason was given for the revival, but news of another severe fall in the U.S. gold stock coupled with a shortage of Kaffir shares made a marked impression on sentiment.

Free State Geduld spurted 5s. to 140s. and Western Holdings moved up 1s. 10½d. to 159s. 4½d. with "Ofsits" 2s. 6d. higher at 87s. 6d. Most of the West Rand issues went ahead, West Driefontein gaining 2s. 6d. to 98s. 9d., and Johannesburg continued to show interest in the Kinross area mines. Winkelhaak improved afresh to a new high of 27s. 9d. and there were rises of 1s. in Bracken (30s. 6d.) and Leslie (22s. 6d.) .

Among the very few dull spots were Merriespruit (2s. 3¾d.) and Virginia (4s. 2¼d.) which eased on reports that Kennecott is seeking to dispose of its interest in the two mines.

Finance stocks moved ahead, Union Corporation being particularly strong and active with a spurt of 3s. to 68s. 6d. Both London and Johannesburg bought Gold Fields which at 73s. 3d. ex-dividend showed a rise of 5s. on the three days. In the Diamond group, "Casts" advanced further to 25s. 10½d. following confirmation of previous scrip issue hopes.

The recent recovery in Rhodesian Copper shares was brought to a halt by Monday's fall in the metal price coupled with renewed nervousness about the political situation, but prices remained fairly steady at the lower levels. Nchanga came back to 48s. 1½d. and Messina at 19s. lost part of the earlier rise which had been inspired by the coming final dividend.

Australian issues had not only the uncertain lead-zinc market to contend with but also the mounting indications of the Commonwealth's economic problems. As a result Mount Isa fell from 47s. to 43s. 6d. during the three days and Consolidated Zinc eased to a new low for the year of 61s. 6d. New Broken Hill, exceptionally, were maintained at 39s. on some local support.

The Tin share market moved rather irregularly but the general trend of the usually small price movements was upwards. It seems that the market has not yet fully recovered from the effects of the recent over-speculation in the East, but soon the stream of sharply increased earnings and dividends must become a dominant market factor. A notably firm share was Gopeng which steadily improved to 28s. 9d. while Ampat moved up to 12s. 3d. Tronoh (37s. 3d.) quickly regained a setback of 9d. and British Tin climbed to 28s. 3d. on a steady investment demand.

Book Reviews

Mineral Processing by E. J. Pryor. *(A Revised and Enlarged Edition of An Introduction to Mineral Dressing) 814 pages, 39 tables and 310 illustrations. Mining Publications Ltd. 90s.*

The appearance of this textbook, which is a revised and enlarged edition of *An Introduction to Mineral Dressing* published in 1955 is most welcome, since as the author says in his preface, "the original introductory matter has been retained but is now developed to a more advanced level". The result is that the basic theory has been strengthened considerably and makes the book much more useful.

Unlike many introductions, Chapter I needs careful reading as it provides a clear picture of the underlying principles to the reader who may not be fully conversant with them. The second chapter dealing with "Acceptance into the Mill" also deals with many important factors, some of which are too often found to be concealed or disseminated throughout the textbook. By introducing the subject at this point, due weight is lent to sundry operations and to the importance of adequate sampling and control. A welcome addition is the strengthening of mathematical presentation, although in a few instances there is probably room for further treatment of this kind.

In the chapters dealing with comminution, an excellent picture is presented of the present knowledge of the mechanics and the forces used. On the whole, the chapters on primary and secondary crushing are excellent. The stamp mill rightly is only briefly mentioned but the hammer or impact mills although admittedly of limited application deserve more attention and the illustration is not particularly representative of the modern range of machines.

Both wet and dry grinding are well covered and a chapter is devoted to grinding circuit control. In addition there is an adequate introduction to laboratory sizing control.

Another welcome modification is the change in the chapter heading from "Gold Cyanidation" to "Chemical Extraction" so that the principles and key methods used for other metals are included, making a very useful introduction to the subject. The section dealing with flotation is excellent and valuable enlargement of the chapter on "Physics and Chemistry of Pulps" has been made.

Throughout the author has never overlooked the practical aspects of plant control; a very necessary adjunct to a good knowledge of fundamental principles for any mill man if he is to succeed in maintaining his plant at optimum efficiency. To make room for the additions and inclusion of new ideas, the original text has been pruned but suffers nothing in so doing; and the total number of pages increased from 649-814. With this expansion, the bringing up-to-date which is inevitable with a rapidly developing technology and the inclusion of more fundamental treatment, the book should be of considerable value not only to studends but also the practising engineer and can be described as a most adequate textbook on Mineral Processing.

Board Changes

Mr. K. G. Hooper has succeeded Mr. W. Randerson as London Secretary of Union Corporation and Secretary of Bay Hall Trust. Mr. Randerson will remain an assistant manager of the Corporation until December 31 next.

★

Mr. R. H. MacWilliam has been appointed a director of Selection Trust.

★

The Messina (Transvaal) Development Co., announce that Mr. P. O'B. Frost is to become a director of the company, and that Mr. W. I. Spence will suceed Mr. Frost as general manager. Mr. C. H. W. Irwin is to take over the position of resident manager at Messina. These appointments took effect from November 1.

★

Consequent upon his appointment as Parliamentary Secretary to the Ministry of Pensions and National Insurance, Mr. Bernard Braine, M.P., has resigned from the Boards of Paringa Mining and Exploration Company Limited and Mawchi Holdings Ltd

★

The death is announced of Mr. A. B. Brink, general manager of Bancroft Mines, Northern Rhodesia.

Change of Address

The Chemicals Sales office of Armour Hess Chemicals has moved to 6 Arlington Street, St. James's, London S.W.1. The Distec Fatty Acid Sales office for the Greater London area will also be at that address. The new telephone number is HYDe Park 7831.

★

The address of the trade section of the Ghana High Commission in London is now: Office of the Trade Commissioner, Ghana High Commission, Melbourne House, Aldwych, London, W.C.2. Tel.: Temple Bar 2913-4.

★

The West Midlands Division of the National Coal Board have announced that telephone numbers for the Divisional public relations officers are now: Office hours: Dudley 55444; outside office hours, night line: Dudley 55891. Mr. P. G. Innel Clement is public relations officer for the area, and Mr. A. Homeshaw, assistant public relations officer.

The Minas Gerais Commission to promote exports from Brazil (see *Mining Journal*, Nov. 11, p. 537) has received an offer from the Polish Diplomatic Service to import 1,000,000 tonnes of iron ore, of which Poland will require altogether 10,000,000.

Mining Journal Index

We much regret that the volume number given on the Index, published with our issue of October 14 for the period January-June, 1960, was given as 253. This should have read 254.

WESTERN SELECTION AND DEVELOPMENT GROUP

Registered Offices: 120 Moorgate, E.C.2

Extract from Mining Companies' Directors' Reports for Quarter ended 30th September, 1960

ARISTON GOLD MINES (1929) LTD.

Authorised Capital £1,500,000
Issued Capital £1,285,714.5.0
In **10,285,714** Units of Stock of **2s. 6d.** each.

OUTPUT AND PROFIT

Tons Milled	118,540	
Gold Produced—fine ozs.	35,689	
Recovery per ton-dwts.	6.021	
	£	Per Ton Milled s. d.
Working Revenue	443,557	74 10
Working Expenditure	359,106	60 7
(*a*) Working Profit	84,451	14 3

CAPITAL EXPENDITURE

Capital Expenditure during the Quarter amounted to **£106,303.**

DEVELOPMENT

A total of **6,514** feet of development was advanced during the Quarter, the total expenditure being **£38,975.**

NORTH OREBODY

11th Level

Footwall driving continued throughout the Quarter, giving the following results:—

	Value Dwts.	Width Inches
No. 273 North Crosscut	4.4	31
No. 274 North Crosscut	7.2	36
No. 275 North Crosscut	7.7	53
15th Level		
No. 268 North Crosscut	9.5	29
No. 271 North Crosscut	7.6	105
No. 273 North Crosscut	3.6	27

28th Level

The main crosscut from No. 3 Winze has been completed and driving southwards started on the 28th Level. Crosscutting on the Level during the Quarter gave the following results:—

	Value Dwts.	Width Inches
No. 256 North Crosscut	6.7	48
No. 257 North Crosscut	5.4	25
No. 258 North Crosscut	6.5	67

No. 2 OREBODY

	Value Dwts.	Width Inches
27th Level		
No. 218 South Crosscut	7.7	211
No. 219 South Crosscut	7.9	102
30th Level		
No. 208 North Crosscut	5.5	107

SOUTH OREBODY

	Value Dwts.	Width Inches
5th Level		
No. 289 South Crosscut (footwall reef)	5.2	33
No. 290 South Crosscut	9.6	47

SHAFT SINKING

No. 4 Winze—This Winze has now reached 28th Level and the installation of the service hoist has been started.

Ankobra Shaft—Sinking was continued throughout the Quarter and the shaft is now **108** feet below the collar of No. 4 Level horizon.

BREMANG GOLD DREDGING CO., LTD.

Authorised Capital £1,250,000
Issued Capital £521,685
In **5,216,848** Units of Stock of **2s.** each.

OUTPUT AND PROFIT

Cubic Yards Dredged	2,920,300	
Gold Produced—fine ozs.	14,576	
Recovery per Cubic Yard—Bullion—Grains	2.39	
	£	Per Cubic Yard Dredged d.
Operating Revenue	184,393	15.15
Operating Expenditure	122,529	10.07
Operating Profit	61,864	5.08

Capital Expenditure during the Quarter amounted to **£4,508.**

AMALGAMATED BANKET AREAS LTD.

Authorised Capital £3,300,000
Issued Capital £2,884,900
In **19,232,669** Units of Stock of **3/-** each.

OUTPUT AND PROFIT

Tons Milled	156,729	
Gold Produced—fine ozs.	36,077	
Recovery per ton—dwts.	4.604	
	£	Per Ton Milled s. d.
Working Revenue	449,859	57 5
Working Expenditure	448,303	57 3
(*a*) Working Profit	1,556	2

CAPITAL EXPENDITURE

There was no expenditure on Capital Account.

DEVELOPMENT

A total of **8,807** feet of development was advanced during the Quarter, the total expenditure being **£63,176.**

	Footage Sampled	Footage Payable	Average Value
Akoon	5,085	2,395	6.6 dwts.
			38.2 ins.
Mantraim	1,390	560	6.5 dwts.
			36.4 ins.
Fanti	560	345	5.2 dwts.
			36 ins.
Tamsoo	835	185	6.0 dwts.
			36 ins.
Effuenta	190	190	5.1 dwts.
			36 ins.

GHANA MAIN REEF LTD.

Authorised Capital £1,500,000
Issued Capital £1,114,363
In **4,457,450** Units of Stock of **5/-** each.

OUTPUT AND PROFIT

Tons Milled	34,005	
Gold Produced—fine ozs.	12,592	
Recovery per ton—dwts.	7.406	
	£	Per Ton Milled s. d.
Working Revenue	156,717	92 2
Working Expenditure	124,403	73 2
(*a*) Working Profit	32,314	19 0

CAPITAL EXPENDITURE

Capital Expenditure during the Quarter amounted to **£8,609.**

DEVELOPMENT

A total of **1,846** feet of development was advanced during the Quarter, the total expenditure being **£12,607.**

MAIN SHAFT SECTION

Development Footage Sampled **515** feet
Development Footage Payable **115** feet
Averaging **9.22** dwts. over **31.9** inches.

TUAPPIM SHAFT SECTION

Development Footage Sampled **700** feet
Development Footage Payable **405** feet
Averaging **10.62** dwts. over **63.0** inches.

STATUTORY WAGE INCREASE

The statutory imposition of increased wages to African Workers, with effect from July 1, 1960, recently announced by the Ghana Government resulted in increased costs for the Quarter as follows:

	£
Amalgamated Banket Areas Ltd.	24,620
Ariston Gold Mines (1929) Ltd.	19,257
Bremang Gold Dredging Co. Ltd.	5,000
Ghana Main Reef Ltd.	6,512

The above figures of costs and profits have been adjusted accordingly.

(*a*) *Excluding Development Redemption*

RHODESIAN ANGLO AMERICAN LIMITED

(Incorporated in Northern Rhodesia)

CHAIRMAN'S STATEMENT

ECONOMIC EFFECTS OF POLITICAL UNCERTAINTY IN CENTRAL AFRICA

PRINCIPLE OF "INDIVIDUAL MERIT" NOT COLOUR AS BASIS FOR FRANCHISE IN MULTI-RACIAL STATES

MR. H. F. OPPENHEIMER REVIEWS PROGRESS OF RHODESIAN ANGLO AMERICAN'S MINING AND INDUSTRIAL INTERESTS

The following is from the Review by the Chairman, **Mr. H. F. Oppenheimer,** which has been circulated to members:—

The operations of the copper mining companies from which we derive most of our revenue were not directly affected by the political disturbances and uncertainty that prevailed for much of the year in Central Africa. The three copper mining companies of the Anglo American Group all had successful years. Rhokana Corporation's production was 103,981 tons and its profit, after tax, including investment income, was £11.5 million. Nchanga Consolidated Copper Mines had an output of 178,000 tons with profit after tax of £13.6 million. Bancroft Mines, in its first full year of operations since the mine reopened, produced 51,000 tons, with a profit of £3.6 million, and was able to declare a maiden dividend of 1s. 0d. per share.

Our profit for the year was £7,134,000. This was only £240,000 less than the record profit earned in the year ended June 30, 1956, when the average price of copper was £371 a ton compared with an average price during the past year of £248 a ton. In 1956, however, Rhokana was faced with a heavy capital programme, and Nchanga, while nearing the end of its four-stage extensions, had embarked on the open-pit project which also involved large capital expenditure. The beneficial results of this capital work were evident last year in increased production and efficiency at both mines.

Effects of Political Unrest

Although the operations of the mines were not affected by the political uncertainty, this brought about a sharp decline in the market price both of our own shares and of our investments. When the offer was made of 6 per cent loan stock carrying options to March 31, 1963, to subscribe for shares at 80s. per share for cash or by tendering loan stock, it was hoped that the majority of the options would be exercised for cash and that much of our requirements of capital to follow up our investments for some years would be provided in this way. So far £588,581 has been subscribed in cash, but the fall in the price of our shares has temporarily stopped the exercise of options and in the present circumstances we clearly cannot rely on the early exercise of the balance of the options to provide the further capital we require. I am therefore pleased that we have been able to transfer an amount of £1,750,000 to the general reserve, which now stands at £6,250,000, and at the same time to recommend a final dividend of 6s. net which, together with the interim of 2s., gives a total distribution for the year of 8s. net.

During the year as a result of underwriting and taking up our rights we acquired £247,705 of the 6½ per cent registered notes issued by The Rhodesia Broken Hill Development Company Limited to provide part of the funds required for an improved plant for the extraction of lead and zinc from the complex ores at that mine. These notes carry the right to subscribe for ordinary shares at 10s. each up to the time when output is expected to be materially increased.

A vigorous campaign of prospecting in the Federation has been continued by Chartered Exploration and the other exploration companies in which we are interested. The possibility of opening up the King Edward Mine near Lusaka, which belongs to Nchanga Consolidated Copper Mines Limited, as a source of pyrites required in the smelter at Nkana, is being investigated.

In January the Kariba hydro-electric project started to supply power to Northern Rhodesia and, shortly after the official opening power was also made available to Southern Rhodesia. The availability of power at a reasonable cost, which it is hoped will be reduced when the full potential of Kariba is exploited, has already influenced the expansion of our mining interests in Northern Rhodesia, and will undoubtedly assist in promoting further industrial activity in the Federation.

In anticipation of the price of power being reduced in a few years time, Rhodesian Alloys is planning to enlarge its plant at Gwelo which produces high quality low carbon ferro-chrome for stainless steel manufacture.

A short distance from Gwelo, at Que Que, the new plant at the Rhodesian Iron and Steel Company's works is now coming into operation and Risco will soon be able to supply the local demand for an increased quantity and variety of steel products.

Constitutional Problems in Africa

You will see that there has been a considerable expansion in that part of the economy with which we are particularly concerned. Calls for material advancement and personal fulfilment are inevitable products of the emergence of the African people, and they must be expected to grow stronger as ambitions and potentialities increase through improved education. This is true of all Africa: but in multi-racial states like the Federation the urgency of helping to meet these aspirations through steady but rapid economic growth is specially pressing.

It must be realized, however, that political uncertainty reduces the rate of economic expansion. This has happened in certain sectors of the Federal economy during the past year, and has contributed to unemployment in some towns and a restriction in the opportunities for advancement.

It would be foolish to expect the convulsions which have seized much of Africa to be free from painful and sometimes alarming effects. Quite apart from the disaster of the Congo, the way some of the new African states have devoloped has been disappointing to many liberal minded people. However, in such states, in the absence of an educated and reasonably sophisticated electorate, some sort of authoritarian government is very likely to emerge. The alternative was not true parliamentary democracy but the enlightened despotism of the Colonial Office, and it does not seem altogether unreasonable that Africans should prefer their own dictators. But, while that is reasonable when you are dealing with purely African countries with only a few thousand European administrators and traders, it is quite another matter when you are concerned with a comparatively large, highly developed European minority which has thrown deep roots in the country. Such a minority will never freely accept, and cannot reasonably be expected to accept, unqualified rule by the African majority in its present state of development. The fact that the Europeans are in a minority does not of itself prove that their point of view is wrong or that their power is negligible.

A peaceful solution to the problem of the multi-racial countries must therefore be sought along other lines from those followed in the purely African territories to the North. It is a great misfortune that the slogan "One man, one vote" should have taken such a hold on liberal opinion. Far from being a guarantee of democracy, experience suggests strongly that, in present conditions, in Africa, it is a guarantee that there will not be a democracy.

The Monckton Report

The Federation is now awaiting the Review Conference at which its future constitution will be decided. The Monckton Report has confirmed, first, that the economic advantages of Federation are substantial for all three territories and, secondly, that, for good or bad reasons, African feeling in Nyasaland and Northern Rhodesia is such that Federation cannot continue without substantial changes to meet African grievances and sentiments. In recommending far-reach-

ing steps to eliminate discrimination on racial grounds in the law and life of the Federation, the report is certainly on firm ground. Nevertheless, there has been great progress in this direction during the year.

It is in the Report's recommendations for new constitutional machinery that it seems to me most open to question. In particular, the proposed composition of the Federal Parliament strikes me as entirely impracticable. In a multi-racial state the principal object should surely be to devise constitutional machinery calculated to encourage politicians to think and act on non-racial lines. The majority of the Commission have, however, abandoned the principle of "individual merit" enunciated in his speech at Cape Town by Mr. Macmillan, echoing Cecil Rhodes' "equal rights for all civilized men". Instead they have recommended an Assembly in which there would be equal numbers of black and white representatives. I am convinced that such a composition would make racial conflict inevitable and government virtually impossible.

I believe that the real hope in a multi-racial country such as the Federation is to stick as firmly as possible to the principle of individual merit, which to my mind implies that anyone irrespective of race who has certain reasonable educational or property qualifications must be entitled to vote on a common roll. We must accept that this means a white political majority now and black political majority in the future. Such a system could only be acceptable if there were effective guarantees against discrimination on racial grounds either in theory or in fact, by the whites now or by the blacks in the future.

Many people believe that whatever the theoretical merits of this line of thought may be, it is of no practical use because it comes up against the "irresistible force" of African nationalism. Whether African nationalism is really irresistible in a multi-racial country has, however, yet to be decided. It is quite wrong to think that the majority group in a mixed state is necessarily the most powerful, still less that it is necessarily irresistible. In Nyasaland, certainly, the African interests must be paramount. In Southern Rhodesia, however, the white population, even though it constitutes only about 10 per cent of the total, is by no means a helpless community whose views can safely be disregarded.

In Northern Rhodesia, the white population is, of course, very much smaller, both absolutely and comparatively, but it is concentrated along the line of rail and in the Copperbelt, and here the proportion is quite high enough to make it unwise to regard its views as negligible.

Short of the use of force by the United Kingdom, and I hardly imagine that is contemplated, solutions must be worked out that can be accepted by both black and white, and it is very dangerous, therefore, to set out with the preconception that, merely because Africans are in the majority, they are irresistible. Moreover, the events in the Congo have shown that an uncritical acceptance of the demands of African leaders, even if they have wide popular support, can amount to a gross betrayal of the interests of the African masses for whose welfare in Northern Rhodesia and Nyasaland the British Government is in the last resort responsible.

In the Federation a great evolutionary process has been started which offers real opportunities to all its citizens. To break it up would immeasurably retard the economic advancement of the Territories and their peoples.

The future of our company is necessarily bound up with the political future of the country in which we operate. I can assure stockholders that our faith in the Federation has not wavered. We believe that the companies with which we are concerned have made an important contribution towards the economic advancement, education and personal fulfilment of tens of thousands of Federal citizens, African and European, and it is my sincere hope that we shall be able to enlarge this contribution in the future.

Copies of the report and accounts and of the complete statement can be obtained from 40 Holborn Viaduct, E.C.1.

RHOKANA CORPORATION LIMITED

(Incorporated in Northern Rhodesia)

MINING OPERATIONS NOT AFFECTED BY POLITICAL DISTURBANCES

SUCCESSFUL NEGOTIATIONS ON AFRICAN ADVANCEMENT

MR. H. F. OPPENHEIMER REVIEWS DEVELOPMENTS IN COPPER MARKET

The following is from the Review by the Chairman, **Mr. H. F. Oppenheimer,** which has been circulated with the annual report and accounts.

The year was free of strikes and industrial disputes and, as the political disturbances in the Federation did not affect mining operations, production throughout the Copperbelt continued uninterrupted. Profits from our own mining operations and income from dividends received on our investments in other copper mining companies were higher than in any year other than 1956 when the copper price averaged some £120 per ton more.

The net profit after taxation last year was £11,534,000 and, after making provision of £2,000,000 for capital expenditure and transferring £750,000 to general reserve, the board was able to recommend a final dividend of 5s. 6d. (net) per £1 unit of stock, which, together with the interim dividend of 1s. 6d., makes a total dividend distribution of 7s. (net) per unit for the year ended June 30, 1960.

Bancroft Mines Limited, in which we have a large interest, made a satisfactory profit of £3,693,000, and has recommended a maiden dividend of 1s. (net) per share.

Copper Market

During the year the world copper market was very much influenced by strikes of long duration at the plants of most of the major United States producers which resulted in a loss in production of over 300,000 short tons of copper. In July, 1959, the copper price on the London Metal Exchange had receded to £215 per ton but, as a result of the exhaustion of stocks held in America, the price advanced steadily, reaching £266 in November. From then on, with a few notable fluctuations, the price was maintained between £250 and £270 until mid-April, 1960, when anticipation of strikes in Chile gave impetus to the market and the price rose to £279, the highest point reached since December, 1956. Thereafter, when it became apparent that the strikes which had broken out at El Salvador and Potrerillos mines at the beginning of May, 1960, were unlikely to be of long duration or to spread to the other copper mines in Chile, the price weakened again, falling to levels around £250 in June, 1960.

During July and August the statistical picture showed that unless there were some reduction in supplies to the market either through strikes or voluntary cuts there would be an oversupply of copper in the last quarter of the year. This position of oversupply is chiefly due to the failure of the United States economy to recover to the extent expected after last year's steel strike, and to increased world production. As a result, the price of copper fell steadily during July and August, reaching £234¼ on September 1. During September the price was held reasonably steady by the expectation of a strike at Chuquicamata.

The producers can, I believe, make a valuable contribution to the stability of the copper price. We have indicated our willingness to act in concert with other major producers in times of oversupply to reduce output or withhold copper from the market. When the price reached £225¼ on October 3, the Anglo American Corporation Group of copper companies, in conjunction with the Rhodesian Selection Trust Group announced a ten per cent cut. Our opinion is that at such times the right step is first to cut sales, not production. This enables producers to establish reasonable stocks from which they can supply the market in times of shortage, and so help to prevent the price running away.

Although the year was free of industrial disputes, the Mining Joint Industrial Council, which consists of representatives of the Copperbelt's six producing mines and six representatives of The Northern Rhodesia Mine Workers' Union, met frequently over a period of nearly a year to evolve a scheme for the further adancement of African employees into the field represented by the European Union. I am glad to say that these negotiations were most successful and produced a solution embodying a unified wage scale in the industry and the promotion of employees on the basis of merit irrespective of colour.

Learner Training Scheme

An important feature of the scheme is that a broad outline of a learner train-

ing scheme for all our employees has been agreed upon and satisfactory wage rates for surface and underground learners have been established. The industry will thus no longer be inhibited from offering mining careers to young men at the end of their schooling. The problem of unemployment amongst European and African youth in Northern Rhodesia is serious and the new training scheme should provide an outlet for these young people, many of whom are sons of our employees.

The inadequacy of facilities for the schooling of Africans, even at the primary level, has caused us anxiety for many years. This year the copper mining companies administered by the Anglo American Group and the Rhodesian Selection Trust Group joined in providing £1.3 million to enable the Northern Rhodesia Government to expand its facilities so that all African children will, over the next few years, be admitted to a course of at least six years primary education. Further provision has been made for secondary education and for the training of African teachers. No time has been lost in making additional classrooms available, and over 1,600 places were provided at the beginning of the new school year in August, 1960, for children who would otherwise have missed schooling or had to wait a year or more for vacancies.

The provision of technical education is of special importance to the industry and to the territory as a whole. The companies which established the Copperbelt Technical Foundation will shortly receive a report on the further requirements for technical education in relation to the needs of industry. This report, which is being produced by a team of leading educationalists under the chairmanship of Sir David Lindsay Keir, should prove of great value to the Governments and the mining industry.

This Review had to go to press before there was time for full consideration of the Monckton Commission's Report. I am, however, proposing to make some comments on the Report and the political situation in Central Africa in my statement to stockholders in Rhodesian Anglo American Limited, the printing of which is being delayed for this purpose. As the outlook for our Company inevitably depends to a considerable degree upon political developments in the Federation, I feel stockholders may like to see this statement.

The statement to stockholders in Rhodesian Anglo American Limited referred to above is published on page 576. Copies have been circulated to stockholders in Rhokana Corporation Limited.

Copies of the report and accounts and of the full statements by the Chairman of this company and of Rhodesian Anglo American Ltd., can be obtained from 40 Holborn Viaduct, E.C.1.

BLYVOORUITZICHT GOLD MINING COMPANY, LIMITED

(Incorporated in the Union of South Africa)

The twenty-third Ordinary General Meeting of shareholders will be held in Johannesburg on November 22, 1960.

The following is an extract from the circulated Statement by the Chairman, **Mr. Thomas Reekie,** dated November 3, 1960.

Working Results

Operations during the year under review were most satisfactory. The tons milled at 1,530,000 and the ounces of fine gold produced at 1,003,329 constitute new records for the Company, reflecting substantial increases of 181,000 tons and 126,079 ounces respectively over the previous peak figures.

These results have been made possible not only by reason of the adequate supply of non-European labour throughout the year, but also, to an important extent, by improved mining methods introduced particularly in connection with the areas served by the "A" series of sub-incline shafts.

The yield improved slightly to 13.115 dwt. per ton and, despite the average amount received for gold being 3d. per ounce less than in the previous year, the working revenue increased by 1s. 3d. per ton milled.

Working costs, partly due to the substantial increase in the tonnage milled and partly to more economical working, decreased by 3s. 7d. per ton milled.

The higher yield and lower working costs resulted in an improvement of £1,222,731 in the gold profit to £7,598,768.

Compared with a quota of 653,720 lb. for the calendar year 1959, the Company's uranium quota for 1960 was reduced to 649,720 lb. and as a result the uranium oxide produced during the financial year under review at 640,770 lb. was 28,215 lb. less than the production in the previous year. The working profit from uranium was accordingly lower by £19,100 at £1,685,111. The associated sulphuric acid plant earned a profit of £163,732, and the total working profit from gold, uranium and acid amounted to £9,447,611, which was £1,206,090 higher than the record established in the previous year.

Accounts

Adding to the above mentioned working profit an amount of £259,529 in respect of sundry net income, including a profit of £171,467 realised on the sale of the Company's remaining holding of Western Deep Levels, Ltd. "A" shares, the total profit before taxation and lease consideration was £9,707,140. Appropriations made were £5,124,742 for taxation and lease consideration, £535,333 for repayments in respect of the capital portion of the uranium and acid plant loans, £1,089,831 for net expenditure on mining assets less realization of investments, and £2,900,000 for the two dividends declared during the year. Accordingly £57,234 remained to be added to the previous year's unappropriated balance, and the balance of the Income and Expenditure Account at June 30, 1960, was therefore £3,048,220. The Revenue Reserves totalled £3,239,996 against which current assets less current liabilities amounted to £3,250,196. Of the total uranium and acid loans of £4,825,882, £2,048,001 remained at June 30, 1960 to be repaid under the existing agreements in quarterly instalments until December 31, 1963.

On capital account net expenditure totalling £1,218,610 was incurred mainly in connection with the new No. 4 Vertical Shaft, pumping equipment, and power supply for the underground workings.

Of the £1,450,000 estimated to be required for capital works during the current financial year, approximately two-thirds will be spent in connection with No. 4 Shaft, and the remainder mainly on equipment for the "B" series of sub-incline shafts, the further expansion of underground pumping facilities and several necessary improvements on surface.

Development and Ore Reserve

Steady progress was maintained in the extension of footwall drives and cross-cuts in the areas served by the "A" series of sub-incline shafts. However, as these are of necessity off reef, in accordance with the policy of establishing additional long-wall stopes at depth in the richer central and eastern portions of the mine, only about 31 per cent of the 68,565 feet developed was on reef. Exploratory development proceeded in the north-western zone above the 6th level haulage and the values disclosed continued to be lower than the average for the mine. The payable ore developed was approximately 7 per cent less at 1,284,000 tons, with a lower gold value but a slightly increased uranium value.

Compared with the estimate of the available ore reserve a year ago, the current estimate of available reserves was 187,000 tons less at 4,478,000 tons, the gold value at 14.6 dwt. and the stoping width at 42.4 inches being 0.1 dwt. and 0.1 inch less respectively, while the uranium value was 0.044 lb. higher at 0.573 lb. per ton.

With the exception of A4 Sub-Incline which at September 30, 1960 still had 162 feet to go to its final depth, the sinking of the "A" series is complete. Some concreting of the shafts and ancillary excavating still remains to be done, but the system is sufficiently far advanced to enable work on the layouts of the "B" series to be commenced.

No. 4 Vertical Shaft

As Shareholders are aware, cross-cuts are being put in on the 6th and 8th levels from the vicinity of "A2" Sub-Incline Shaft to connect with No. 4 Shaft. At September 30, 1960, the west cross-cut on the 6th level had advanced northwards 1,041 feet with 1,806 feet still to go, and the east cross-cut had advanced 1,919 feet, leaving 1,124 feet to be done. The 8th level cross-cut had reached a point 2,247 feet north, or 2,110 feet from the site of the new vertical shaft. The shaft had been sunk and concrete-lined to a depth of 255 feet below surface. The monolithic concrete framework of the headgear has since been completed to its full height of just over 238 feet above ground level, and full scale sinking is expected to commence next month. The erection of the winder house and other ancillary buildings at shaft head has made satisfactory progress.

CONSOLIDATED MAIN REEF MINES AND ESTATE, LIMITED

(Incorporated in the Union of South Africa)

The sixty-second Ordinary General Meeting of shareholders will be held in Johannesburg on November 22, 1960.

The following is an extract from the circulated Statement by the Chairman, **Mr. Thomas Reekie,** dated November 3, 1960.

Working Results

The steady contraction in the scale of the Company's mining operations became more marked during the year under review than previously. The tonnage milled declined by 521,000 tons from 1,492,000 tons in the previous year to 971,000 tons, while the monthly milling rate fell from 110,000 tons in July, 1959 to 61,000 tons in June, 1960. The lower milling rate was mainly responsible for increasing the working costs per ton milled by 8s. 9d. to 47s. and, while an overall improvement in yield resulted in increasing the revenue per ton milled by 8s. to 48s. 7d., the working profit per ton milled was lower by 9d. On the reduced tonnage milled, these factors resulted in a working profit of £78,707 for the year compared with £174,802 for the previous year. To the figure of £78,707, however, was added £37 487 derived from the recovery of 3,000 ounces of gold in clean-up operations, giving a total working profit of £116,194.

Accounts

The Company's net income for the year was £232,591. This amount, together with the unappropriated balance of £444,005 brought forward from 1959, gave a total of £676,596. Two dividends of 1s. 3d. and 1s. 6d. per share respectively, absorbed £171,545, leaving a balance of £505,051 in the Income and Expenditure Account at June 30, 1960.

Development and Ore Reserve

The footage developed decreased substantially from 25,241 feet to 9,665 feet. In turn the footage sampled declined from 18,320 feet to 6,550 feet and although the inch-dwt. value improved from 313 inch-dwt. to 365 inch-dwt. the percentage payability of 13.6 per cent was 4 per cent lower than in the previous year. The estimated total ore reserve at June 30, 1960 was 410,000 tons of a value of 7.5 dwt. over an average width of 39.6 inches.

Position at the Mine

Despite a much lower milling rate than during the previous year, the drain on the total ore reserves could not be matched by replacement tonnage from development. Mining operations on the Bird and Kimberley Reefs have been terminated since the close of the financial year, and for the same reason it is anticipated that work on the Main Reef and Main Reef Leader horizons in the south western portion of the mine will have to be discontinued shortly. The closure of this south western area, concurrently with the exhaustion of ore in the 3A Incline Shaft pillar, will require the scale of operations to be reduced still further and it is expected that a substantial reduction in the milling rate will take place early in 1961. In the circumstances it was considered necessary to give the statutory three months' notice to the Government, of the Company's intention to curtail mining operations. Under existing conditions it must be accepted that the profitable life of the mine is very limited but all reasonable steps are being taken to maintain operations at a profit for as long as possible. A clean-up plant was erected and commissioned by the end of the financial year.

Dividend Policy

Shareholders are probably aware that it is a frequent practice for mining companies which are nearing the end of their profitable lives to commence making reduction of capital payments instead of continuing with dividend declarations.

For the information of Shareholders, it can be said that public companies which hold shares in other companies generally prefer to receive dividends rather than reduction of capital payments for the reason that the former are not only tax-free in their hands, but are also available for redistribution in the form of dividends to their own shareholders. Repayments of capital received by these companies would ordinarily be applied to reduce the value of the particular investments held by them and would not be utilized for dividend purposes. Apart from the position of public companies however, it is appreciated that certain other Shareholders might, for tax reasons, prefer reduction of capital payments. It must nevertheless be remembered that it is necessary for a company, before reducing its capital, to obtain the approval of at least 75 per cent of the Shareholders present at a general meeting at which not less than one-quarter of the share capital is represented. In the case of your Company a very substantial proportion of its shares is held by public companies, and after consideration, your Board is of opinion that a proposal to adopt a policy of capital repayments would not receive the required support. It has, therefore, been decided that such of the Company's funds as become available for the purpose will continue to be distributed by way of dividend.

HARMONY GOLD MINING COMPANY LIMITED

(Incorporated in the Union of South Africa)

The tenth Ordinary General Meeting of shareholders will be held in Johannesburg on November 21, 1960.

The following is an extract from the circulated Statement by the Chairman, **Mr. P. H. Anderson,** dated November 7, 1960.

Operations at the Mine

Operations at the mine during the year ended June 30, 1960 were substantially in accordance with the Company's overall planning and the increase in the milling rate to 165,000 tons per month during June, 1960 may be considered satisfactory.

During the year under review the development footage accomplished was 12,331 feet greater than during the previous year, the total footage advanced being 87,417 feet, of which 72,546 feet were off-reef. The ore developed increased by 736,000 tons to 2,339,000 tons, but gold and uranium values at 8.6 dwt. and 0.592 lb. per ton were respectively 0.6 dwt. and 0.093 lb. per ton lower, whilst the width was 2.3 inches less. Compared with the previous year's available ore reserve, the estimate at June 30, 1960 was 1,126,000 tons greater at 4,692,000 tons, the gold value at 8.6 dwt. and the stoping width at 50.5 inches, being 0.6 dwt. and 1.9 inches less respectively, while the associated uranium value was 0.071 lb. per ton less at 0.610 lb. per ton.

In my statement to Shareholders last year I mentioned that in the No. 2 Shaft area the presence of "Khaki Shale" had given rise to difficulties in controlling the hanging-wall, and that the stoping width was above the average for the mine. The position during the year under review did not alter materially, but more recently some success has been achieved in narrowing the stoping width in the No. 2 Shaft area. During the first quarter of the current financial year an average of approximately 4.65 million gallons of water per day were pumped from the mine. The pumping capacity at 13 million gallons per day is well in excess of this figure.

Good progress has been maintained with the capital programme, both on surface and in respect of underground installations.

The amount spent on capital account during the twelve months ended June 30, 1960 was £2,019,989, and it is estimated that expenditure of £1,500,000, details of which are given in the Directors' Report, will be incurred during the financial year ending June 30, 1961.

Uranium, Pyrites and Sulphuric Acid

Although the yield of uranium at 0.474 lb. per ton treated was 0.030 lb.

per ton less than during the previous year, the uranium recovered increased by 26 per cent due to the greater tonnage treated. The sulphuric acid plant was commissioned during the year and at the end of the first six months of production 22,821 tons of sulphuric acid had been produced at a profit of £106,110. The total profit from uranium, pyrites and acid at £2,512,039 accounted for 44.5 per cent of the total working profit.

As the tonnage to the gold plant increases, it will be necessary to accumulate slime which is in excess of the capacity of the uranium plant.

Financial

Your Company's profit for the year, after allowing for United Kingdom taxation on interest received, was £5,508,561 and was distributed as follows:—

	per cent
Repayment of Loans ...	16.0
Capital Expenditure and Trade Investments ...	38.5
Dividends Nos. 7 and 8 of 1s. 3d. per share each ...	40.8
Balance added to Income and Expenditure Account	4.7
	100

Dividend No. 9 of 1s. 4½d. per share was paid to Shareholders early in November, 1960.

Taxation

At June 30, 1960 the Company had an estimated income tax loss of £6,740,000 and an estimated lease loss of £6,980,000 and therefore no Union taxation or lease consideration is as yet payable by the Company.

WANKIE COLLIERY COMPANY LIMITED

(Incorporated in Southern Rodesia)

EFFECTS OF KARIBA POWER ON SALES
INCREASED INVESTMENT INCOME

The following is from the the Statement by the Chairman, **Mr. K. C. Acutt, C.B.E.,** which has been circulated with the annual report and accounts:—

Coal sales of 3,849,618 tons reflect an increase of 231,001 tons over sales last year, but as a result of power becoming available from the Kariba Hydro-Electric project, the demand for coal for thermal generation was falling at the end of our financial year. As further power becomes available from Kariba, there will be a further decline in the demand for coal for power-generating purposes, but there has been a welcome, although at present small, increase in the consumption of coal in other fields. I am hopeful, therefore, that as a result of the industrial development which is taking place or is planned in the Federation, sales, although likely to be lower for a few years, will remain at reasonably satisfactory figures.

As the chairman indicated last year, we hope that with the assistance of our rising investment income and by drawing, if necessary, on unappropriated profits, we will be able to maintain dividends at their present level during the period that coal sales may suffer a decline.

Sales

Our coke sales for the year showed a small decrease of 16,417 tons compared with last year, but this was largely caused by the commissioning of the new coke ovens at the Rhodesian Iron and Steel Company Limited works which draws its coal from us. There, however, appear to be good prospects for a higher level of coke sales next year.

Our sale of coal, coke and tar to the former territory of the Belgian Congo was adversely affected by the unrest which followed the granting of independence in July. Deliveries of these products to the Union Miniere copper mines and the Katanga Railways were resumed very quickly, but supplies to general consumers in the territory were suspended for several weeks.

The highly competitive conditions in the coal export market continued during the year, and in spite of our efforts to obtain an outlet for some of our surplus production capacity, we have been unsuccessful. We and our export agents are, however, continuing our efforts.

Satisfactory improvement was achieved in our brick sales but sales of the various items from our by-products plant were generally lower than 1959.

The profit for the year, before charging taxation, was £1,639,060, which is £267,016 higher than last year. Most of this increase in profit is attributable to additional sales but revenue from investments also increased and was £67,649 higher than last year.

Investments

Most of the Company's funds are invested in short term loans of £2,350,000 to Anglo American Rhodesian Development Corporation Limited, which has purchased railway trucks for hire to the Rhodesia Railways, and a direct loan of £500,000 to the Rhodesia Railways. In addition, we hold £675,260 of medium and long term Federal Government Stocks.

During the year we invested the sum of £266,624 in shares of Rhokana Corporation Limited and Nchanga Consolidated Copper Mines Limited. This, together with our interest in our subsidiary company Sandringham Investments Limited, and an increased holding in Clay Products Limited arising from a further issue of capital by that company, brought our total holdings in Rhodesian equities to £390,577.

We have purchased £469,500 of our own debentures on the market at satisfactory prices. The difference between the purchase price and the nominal value of the debenture stock, an amount of £59,479, has been placed to reserve.

Coal Price

The notified average selling price of coal within the Federation, which was fixed at 20s. per ton with effect from November 1, 1959, is to remain unchanged until October 31, 1961, subject however to the right to apply to the Government for a revision of the price in the event of any unforeseen conditions arising before that date.

The deficiency revenue of £91,024 calculated in terms of the price agreement and brought forward at the end of last year, has been reduced to £33,595. This amount is recoverable in future years.

During the year it became clear that the production capacity of Nos. 2 and 3 Collieries was adequate to meet the estimated demands in the next few years, and in March this year it was decided to close down No. 1 Colliery which had been placed on a care-and-maintenance basis some two years ago. The old underground workings of this colliery are expensive to maintain and the Consulting Engineers recommended that these old workings should be abandoned and sealed off. No loss of coal reserves will result from this decision, as if at some future date it should be desirable to restart production in the No. 1 Colliery area, a new shaft would make available the coal which remains to the north of the old workings and no difficulties would be experienced in transporting this coal to the existing surface plant. Nos. 2 and 3 Collieries have continued to operate satisfactorily during the year.

In May of this year, the first annual Central African Trade Fair was opened in Bulawayo by Her Majesty Queen Elizabeth, The Queen Mother. The Company exhibited a display of its products which attracted considerable interest from visitors attending the Trade Fair from the whole of Southern Africa.

Personal

Mavor and Coulson announce that Mr. Robert M. Clive has been appointed as general sales manager and will operate from head office in Glasgow early in 1961.

★

The mining plant division of F. Taylor and Sons (Manchester) Ltd., a member of The Steel Group of Companies, announce the appointment of Mr. T. H. B. Lawther, as a technical sales executive.

★

Mr. Geoffrey B. Taylor has been appointed a director of the Rhymney Engineering Co., in place of Mr. W. Messer, who has retired.

★

The United Steel Companies Ltd., announce that Lt.-Cdr. G. W. Wells, managing director (production) of the company, and director and general manager of the Appleby-Frodingham Steel Co. branch, has been appointed chairman of Appleby-Frodingham Steel Co. Ltd. Mr. J. D. Joy, director and deputy general manager of Appleby-Frodingham, becomes director and general manager of the branch

THE PERAK RIVER HYDRO-ELECTRIC POWER COMPANY

RESULTS SHOW MARKED IMPROVEMENT

The 34th annual general meeting of The Perak River Hydro-Electric Power Company, Limited, was held on November 10 in London, **Mr. Hugh G. Balfour** (the Chairman), presiding.

The following is an extract from his circulated statement:

The Company's operating results for the year ended July 31, 1960, show a marked improvement on the previous year, following the progressive relaxation of restrictions on tin exports, and I am confident that the figures will be regarded as satisfactory.

The permissible export quota from Malaya, under the International Tin Agreement, as related to our financial year, was 50,138 tons, equivalent to a quota of 84.16 per cent of the basic year under the tin control scheme, compared with 32,521 tons, or a 54.6 per cent quota, in respect of the previous financial year, and the improvement in the tin position was immediately reflected in the demand for electricity from the Company. The total units generated at 386,735,700 represented an increase of 46 per cent over the previous year.

A total of 170,896,100 units was generated by the Chenderoh Station, 20 per cent more than last year, but still some 20 million units less than we expect to have in a normal year.

It is in the national interest that the public supply of electricity in Malaya should be co-ordinated between the different areas and authorities where economic and convenient. With this end in view we are examining, with the Central Electricity Board, the possibility of taking a bulk supply of electricity from that Board to supplement existing resources and to assist in meeting the increasing demand for electricity. The Company also has plans under active consideration for the installation of further generating plant at Malim Nawar.

The business of our Subsidiary Company, the Kinta Electrical Distribution Company, Limited, continued to expand. Sales of power increased by nearly 9 per cent and the overall increase in units sold for the year was 5.45 per cent. The total number of units sold was 19,327,172.

The Accounts

Gross Revenue at £1,502,688 shows an increase of £458,486 over the previous year which directly reflects the improved state of the tin mining industry. Malayan operating expenses, after recoveries under the Fuel Clause provisions, were £666,963, an increase of £58,966 over the previous year. The balance for the year carried to Net Revenue Account at £852,686, is £406,525 up on the preceding year. Depreciation requires £320,000 and taxation takes £237,635, leaving the profit for the year at £295,051 as compared with £70,161 last year.

Your Directors recommend a final dividend of 6 per cent, and a special dividend of 5 per cent, on the Ordinary Share Capital of the Company. The special dividend is recommended in view of the lower return to Ordinary Shareholders on their investment during the period of tin restriction.

Since the end of the Company's financial year, all controls on the export of tin from Malaya under the International Tin Agreement were removed as from October 1, 1960. The Company's monthly returns to date are running at a very satisfactory level and, in the absence of any adverse outside factors, the current financial year should show results at least as good as in the year under review.

The report was adopted.

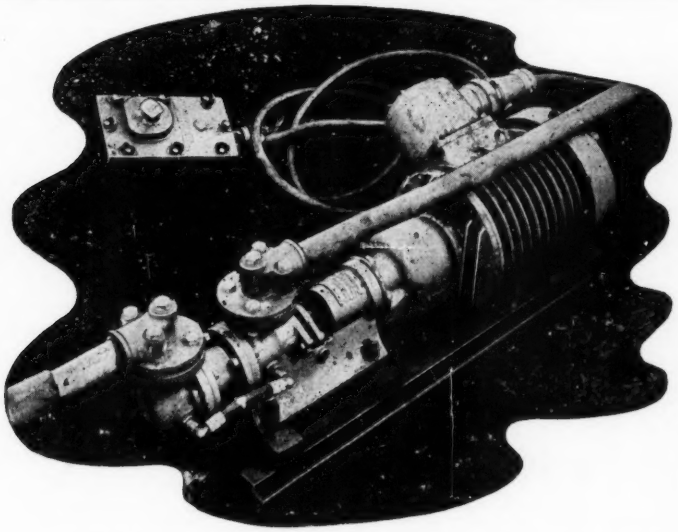
BURMA MINES LIMITED

reports that the operations of

BURMA CORPORATION (1951) LIMITED

for the year ended June 30, 1960, resulted in an estimated **Net Profit** of **K.21,86,700 (£164,002)** as against **K.27,33,051 (£204,979)** for the previous year.

Details of Revenue, Expenditure, Ore Extraction and Production may be obtained from Central Registration Limited, 9, Basinghall Street, London, E.C.2, upon application.



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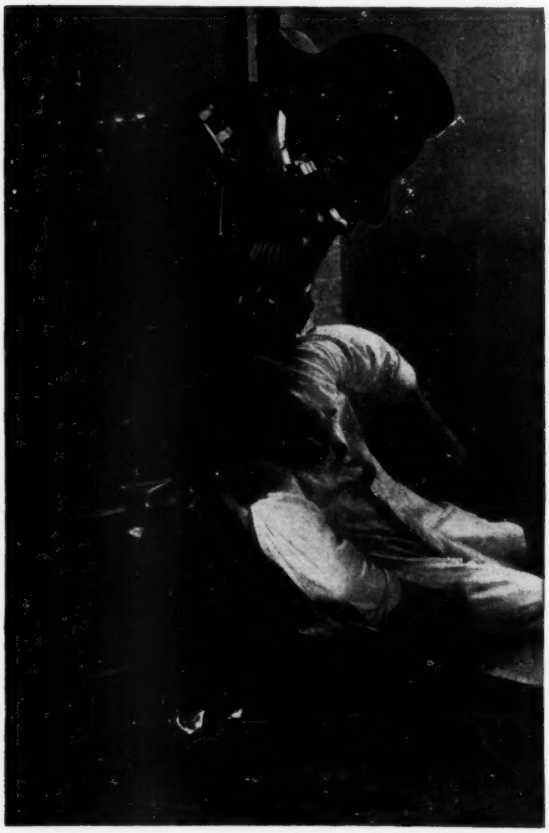

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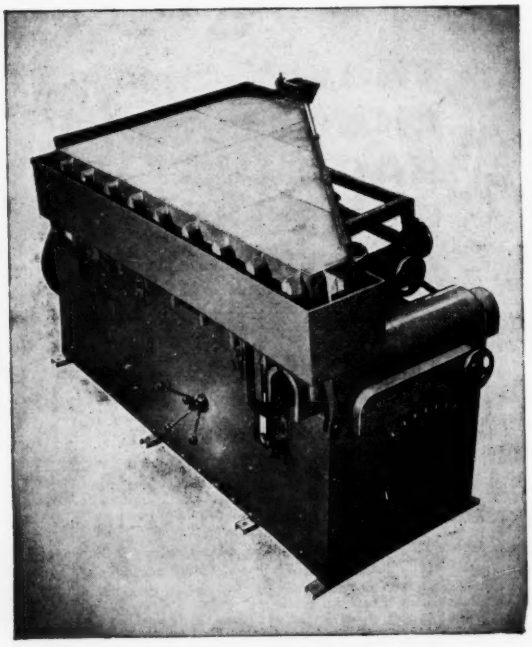

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More information ? Send for technical folders.

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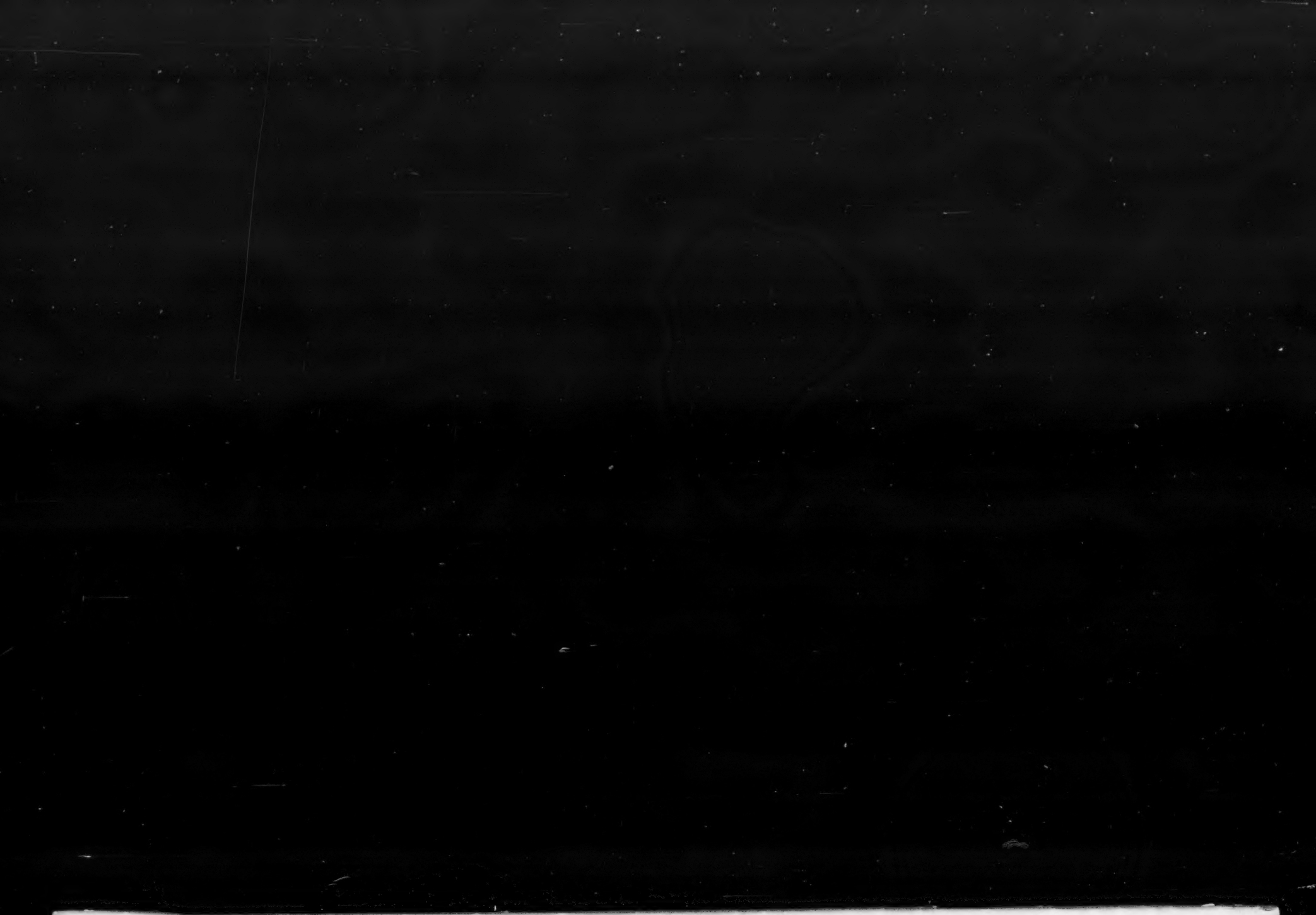
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